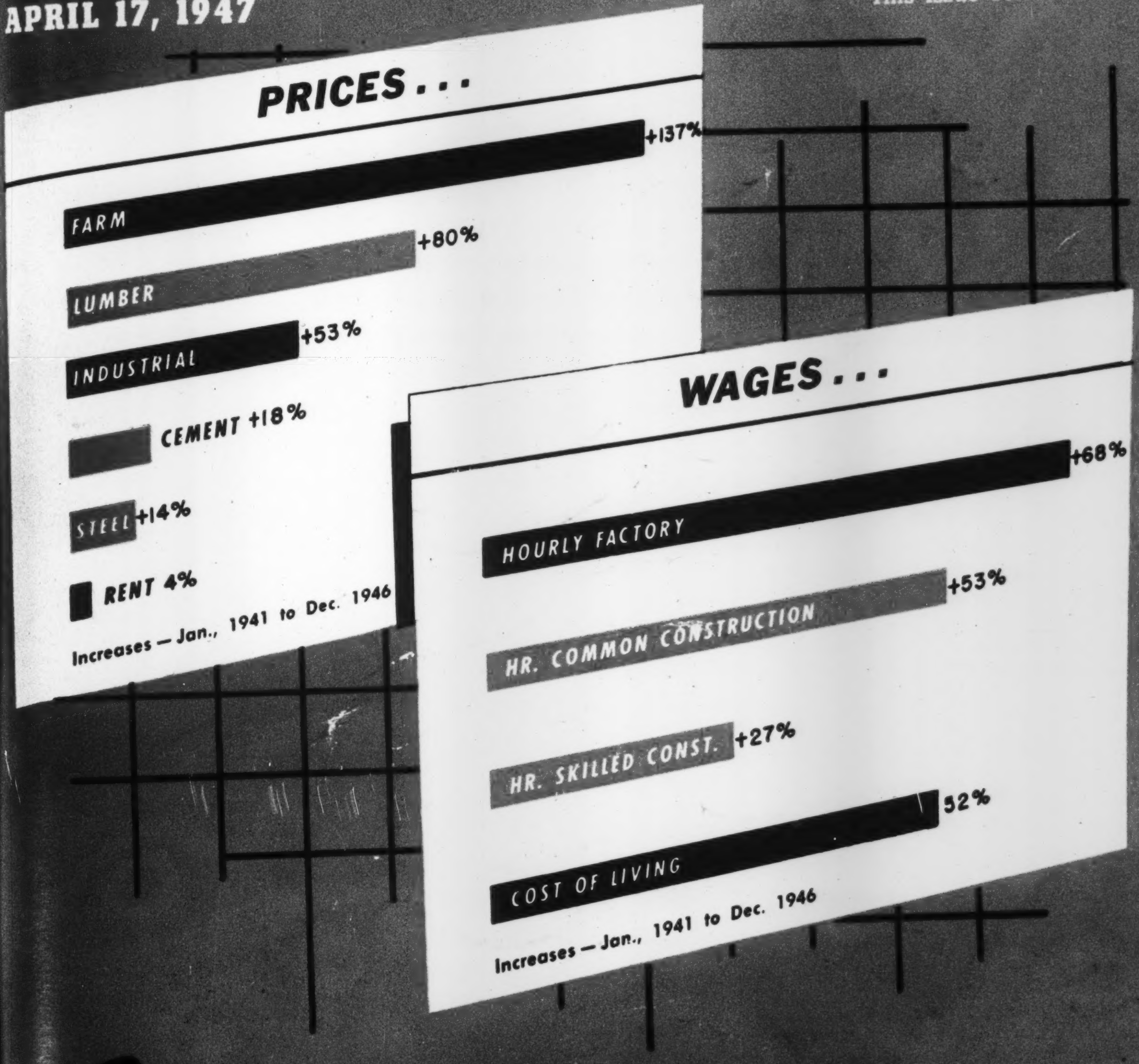
APR 23 1947

ENGINEERING NEWS-RECORD

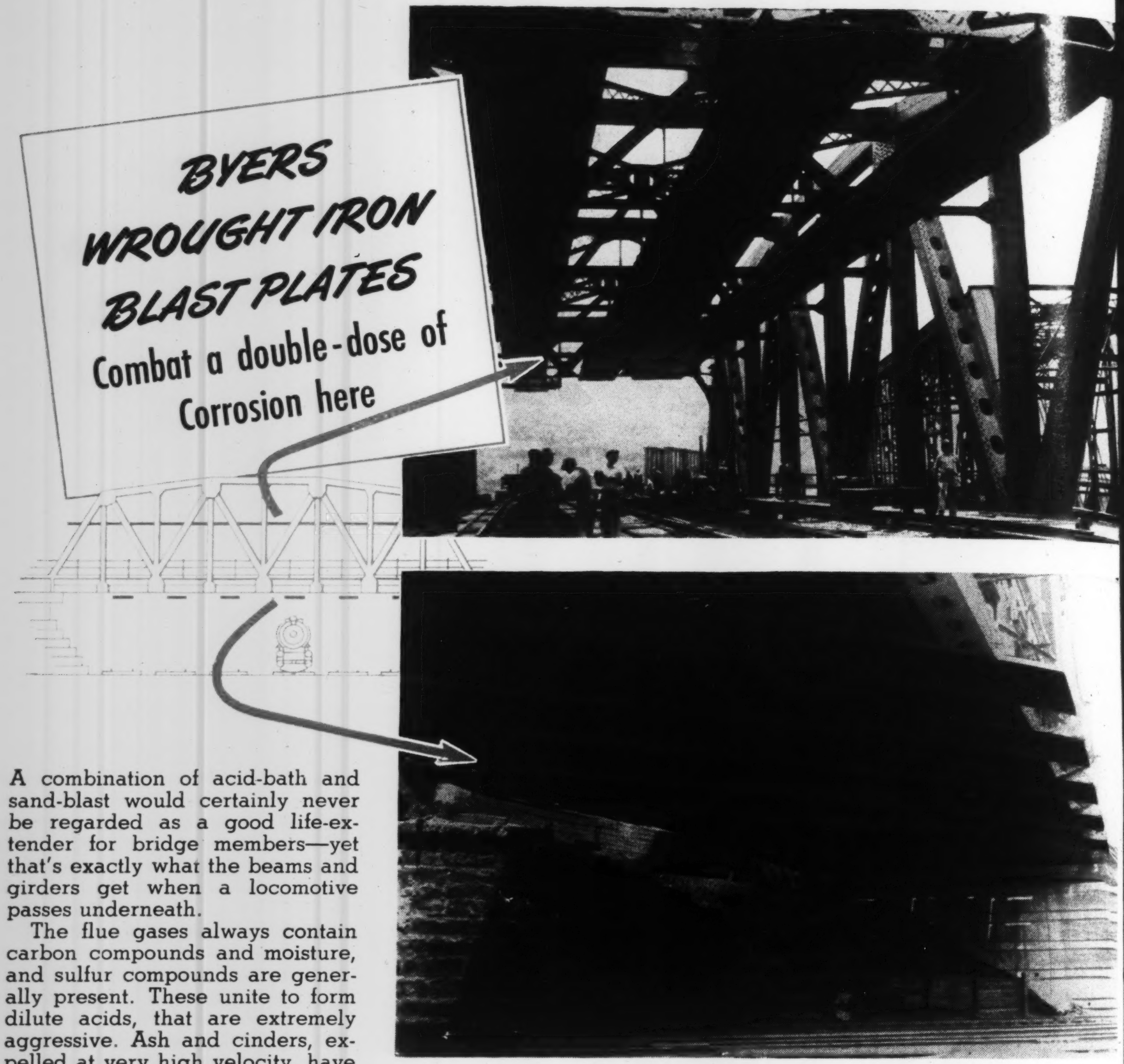
A McGRAW-HILL PUBLICATION

APRIL 17, 1947

This Issue Price $2.00



Construction Costs Number



A combination of acid-bath and sand-blast would certainly never be regarded as a good life-extender for bridge members—yet that's exactly what the beams and girders get when a locomotive passes underneath.

The flue gases always contain carbon compounds and moisture, and sulfur compounds are generally present. These unite to form dilute acids, that are extremely aggressive. Ash and cinders, expelled at very high velocity, have a sand-blasting action that tends to remove surface scale, and leave the bare metal exposed to fresh attack.

A new bridge built by the American Bridge Company for the Union Railroad at East Pittsburgh, Pa., was exposed to a double-dose of corrosion, as it not only carried railroad traffic, but also overpassed it. The engineers used a time-tried method of shielding the bridge against damage, by installing blast plates, above and below, of Byers Wrought Iron.

The wide-spread use of wrought iron for this service goes back to the days when the entire structure was built of this material. Engineers, remembering that such bridges were highly resistive to corrosion from blast gases, started to shield the exposed parts of modern bridges with wrought iron. In some recorded cases, wrought iron has stood up under attack for 50 years or more.

There is a double reason why wrought iron serves so well in this application. The tiny fibers of glass-like silicate slag threaded through the body of high-purity iron act like baffles, to halt and disperse attack, and so discourage pitting. Furthermore, these fibers help to anchor the initial protective film, resisting the sand-blasting action, and shielding the underlying metal.

You will find some information on blast plate installations in our bulletin, "Wrought Iron for Bridge Construction." Ask for a copy.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewerage, Waterworks, Bridges, Roads, Dams, Foundations, Earthwork, Flood Control, Public Works, Airports, Irrigation, Canals, Tunnels, Railroads

Volume 138 • Number 16 April 17, 1947

ALBERT E. PAXTON..........*Publisher*
WALDO G. BOWMAN............*Editor*
EDWARD J. CLEARY....*Executive Editor*

•

ASSOCIATE EDITORS—V. T. Boughton, R. K. Tomlin, H. W. Hunt *(New York)*, V. B. Smith *(Chicago)*, J. R. Carr *(Cleveland)*, N. A. Bowers *(San Francisco)*, A. N. Carter *(Washington)*

ASSISTANT EDITORS—F. S. Merritt, John C. Bumstead; *(New York)*, L. L. Wise *(San Francisco)*

NEWS EDITORS—E. E. Halmos, Jr. and T. D. MacGregor

STAFF ASSISTANTS—Ethel Lyon, Helen McCord.

BUSINESS NEWS—Elsie Eaves, *manager*, J. A. Mahoney, E. R. Biggerstaff, Marie W. Roessler

ENGINEERING NEWS-RECORD

Published By
McGRAW-HILL PUBLISHING CO., INC.

Publication Office:
99-129 N. Broadway, Albany 1, N. Y.

Editorial and Executive Office:
330 W. 42nd St., New York 18, N. Y.

FEATURES IN THIS ISSUE

News of the Week 69
Editorials 76
Center Hill Dam 78
Traffic Interchange for Los Angeles Parkways 84
Pushing a Pipeline Across Marshland 86

CONSTRUCTION COST SECTION

Construction Labor Productivity 92
Costs Cut on Public Housing Project 94
How to Get Lower Cost Bridges 98
Industrial Plant Cost Reaching Peak 101
Cost Comparisons Aid Selection of Building Materials 102
Highlights of Construction Costs—1947 107
ENR Construction and Building Cost Index 108, 109, 111
Construction and Building Cost Indexes 109-119
ENR Construction Volume Index 111
Federal Man-Hours of Labor Estimates 113
Prices of Construction Materials 121-129
Construction Wage Rates 131-140
Road Building Costs 142
Depreciation Schedule—U. S. Bureau of Internal Revenue 145-147
Base Rates on Compensation Insurance 149
Index of Construction Machinery Prices 150
Construction Equipment Rental Rates 153
Cost of Financing 155
Index of Small House Cost 157-159
Unit Prices, Index 161

DEPARTMENTS

Construction Trends 67
Comment and Discussion 89
New Aids 212
Men and Jobs 236
Elections and Activities 248
Manufacturers' Activities 262
Manufacturers' Publications 268
Construction Reports 305

Number of Copies of this issue printed 43,850

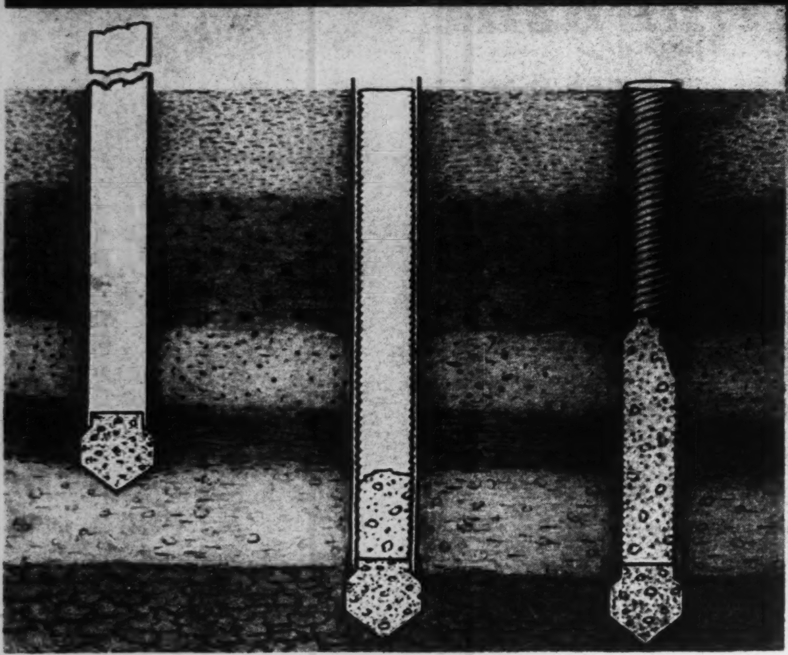
A 16-YEAR CONSOLIDATED INDEX

A consolidated index of Engineering News-Record covering the years 1928-1943 inclusive will be available late in April. This 414 page book includes all articles published during those years and all news items except those of ephemeral nature. Its price is $8. Copies can be obtained by sending this coupon with a check or money order to:

THE EDITOR, ENGINEERING NEWS RECORD
330 West 42 St., New York 18, N. Y.

ENGINEERING NEWS-RECORD. Published every Thursday. **Return postage guaranteed.** Vol. 138, No. 16. Price 35c per copy. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 99-129 N. Broadway, Albany 1, N. Y., or 330 W. 42nd Street, New York 18, N. Y. Subscriptions, United States and U. S. Possessions, $6.00 for one year, $9.00 for two years, $12.00 for three years. Canada $7.00 for one year, $11.00 for two years, $14.00 for three years. Latin American countries $10.00 for one year, $16.00 for two years, $20.00 for three years. All other countries, $20.00 for one year, $30.00 for two years, $40.00 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter October 29, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in the U.S.A. Cable Address: "McGraw-Hill New York." Member A.B.P. Member A.B.C. Copyright 1947 by McGraw-Hill Publishing Company, Inc. All rights reserved. James H. McGraw, Founder and Honorary Chairman; JAMES H. McGRAW, JR., President; CURTIS W. McGRAW, Senior Vice-President and Treasurer; JOSEPH A. GERARDI, Secretary; NELSON BOND, Director of Advertising; EUGENE DUFFIELD, Editorial Assistant to the President; and J. E. BLACKBURN, JR., Director of Circulation. **Publication office: 99-129 North Broadway, Albany 1, N. Y. Editorial and Executive Office: 330 West 42nd St., New York 18.** District Managers and Branch Offices: Fred G. Hudson and L. H. Hunt, 520 N. Michigan Ave., Chicago 11; 738-39 Oliver Building, Pittsburgh; J. W. Otterson, 68 Post St., San Francisco 4; Aldwych House, London, W. C. 2, England; Washington; J. M. Spackman, New York; A. B. Cozzens, Philadelphia; E. E. Duff, Jr., Cleveland; B. F. Horn, Detroit; W. E. Donnell, St. Louis; R. N. Phelan, Los Angeles; W. G. Payne, Boston; Ralph Maultsby, Atlanta, Ga

FOUNDATION SECURITY



WESTERN'S BUTTON BOTTOM PILES HAVE NEVER FAILED

When a firm bearing stratum must be reached, Button Bottom Piles* often provide the surest, easiest, and most economical solution.

The over-size precast point reduces unit pressure on the bearing stratum and increases its density, thus providing ample carrying capacity from the start. When the soil packs back around the shaft, skin friction increases with age, adding still further to safety.

Precast Button Bottom, followed by steel casing, is driven into bearing stratum, forming a bulb of pressure.

Corrugated steel shell is then lowered undamaged inside protective driving casing, and locked onto Button Bottom.

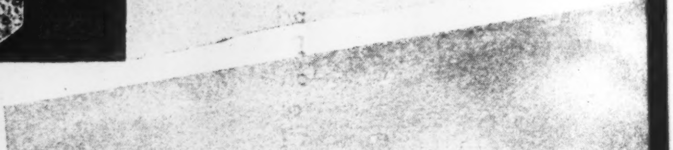
Shell is filled with concrete and casing withdrawn, allowing compressed soil to expand and grip pile shaft.

RECENT BUTTON BOTTOM JOBS BY WESTERN:

- **WAREHOUSE**—Philadelphia, Pa. Navy Yard
- **DRYDOCK**—Boston, Mass. Navy Yard
- **WATER TREATMENT PLANT**—Adrian, Mich.
- **HOUSING PROJECT**—Hartford, Conn.
- **SEWAGE DISPOSAL PLANT**—Ft. Wayne, Ind.
- **N. A. S.**—Alameda, Calif. and Norfolk, Va.
- **STEAM GENERATING PLANT**—Norfolk, Va.

YOUR JOB: Although WESTERN usually employs one or more of its six exclusive types of foundations, brand-new variants will be created where necessary to solve your particular job. WESTERN has never had a failure! If you have a foundation problem, make use of our FREE CONSULTATION SERVICE . . . no obligation.

***Patented — Only WESTERN uses Button Bottom Piles.**



This Warehouse at the Norfolk Navy Yard rests securely on Western's Button Bottom Piles.

FOUNDATIONS FOR

INDUSTRIAL PLANTS, POWER PLANTS, STEEL PLANTS, BRIDGES, PIERS AND DOCKS, WAREHOUSES, AIRPORTS, HOUSING PROJECTS, SCHOOLS, COMMERCIAL BUILDINGS, ETC.

WESTERN FOUNDATION COMPANY
308 W. Washington St., Chicago 6, Ill.

WESTERN CONCRETE PILE CORP.
2 Park Avenue, New York 16, N. Y.

Construction Trends

Watchful Waiting Enters Industrial Building

Industrial building contracts reported by *Engineering News-Record* in the first quarter of 1947 are 25 percent below their 1946 dollar volume. Since building costs are at least 20 percent higher in the 1947 quarter, the decline in physical volume of industrial construction would be around 37 percent.

In this same period the backlog of proposed industrial building construction projects recorded by *Engineering News-Record* increased 56 percent in dollar volume over the same period in 1946; or 30 percent, correcting for higher costs, in 1947.

The conclusion is inescapable that some prospective builders are hoping or expecting that actual building costs will level off or decline. They are given aid and comfort by a prediction in the construction costs section of this issue by E. Warren Bowden, Vice President, Walter Kidde Constructors, Inc., that *actual* costs can be brought down from 9 to 16 percent when material and equipment supplies are adequate, labor productivity improves, and other "reconversion" problems are brought under control. No reduction in wages and materials prices are counted on. Mr. Bowden further believes this gradual decline in actual cost can start within the coming six to eight months, following a slight further increase.

This decline from the 1946 rate in industrial buildings is not uniform across the board. It is greater in the smaller projects. The average project reported in 1947 through March is $300,000, compared with $220,000 in the same period of 1946. Even using 1946 construction dollars the adjusted 1947 average cost per project of $250,000 is above the average size in 1946.

By industries, railroad service buildings are up 118 percent, public utilities up 103 percent, foundries up 164 percent, machines and machine parts up 56 percent, and wood industries up 11 percent. Declines are in automotive service buildings, 69 percent; process industries, 15 percent; food industries, 58 percent; metal refining and rolling, 92 percent; auto factories, 97 percent; textiles, 35 percent; general factories, 51 percent; refrigerator and cold storage, 63 percent.

Actually, 1946 saw the highest volume of private industrial building construction in history, $1,113,000,000 for 3,548 projects of $55,000 and over in size as reported by *Engineering News-Record*. This was an average per week of $21.4 millions for the year compared with the 1st quarter 1947 weekly average of $14.7 millions.

At the end of March, 1946 the backlog of proposed industrial building projects on record with *Engineering News-Record* was $1,566,638,000. By March, 1947 this had increased to $2,769,776,000 at an average rate of $100,000,000 per month. During the first quarter of 1947 this average increase in the proposed industrial building backlog is $122,600,000 per month.

In the first quarter of 1946, $108,759,000 in proposed industrial buildings advanced to active status and were removed from the backlog. An additional $146,153,000 went under contract direct, without having been recorded first as proposed. This is a ratio of 43 percent of the new construction coming out of the recorded backlog.

In the same period of 1947, $103,420,000 advanced to active status and came out of the backlog, and this represented 54 percent of the new contracts reported.

Thus, there is in existence enough potential industrial building construction to establish new high records. But the current watch and wait tactics will have to be overcome if one of those records is to be set this year.

Contracts for Industrial Building Construction By Industry

as Reported by *Engineering News-Record* covering Projects $55,000 and over in size

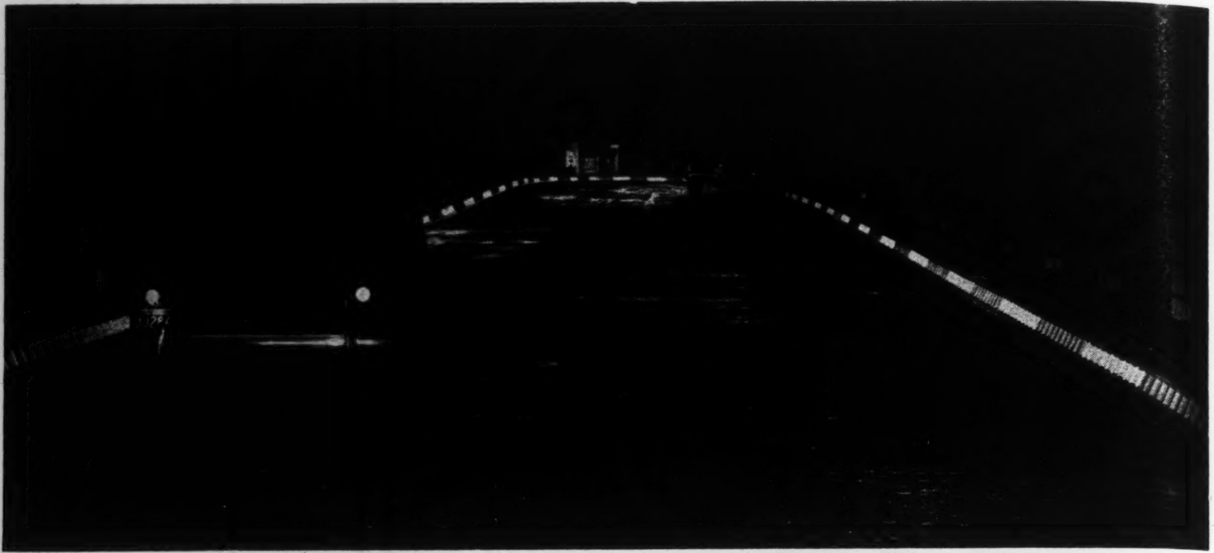
Transportation Service	No.	1946 Thous. $	No.	1947 Thous. $	1947 Volume compared with 1946
1. Railroads	7	$1,743	17	$3,800	+118%
2. Automotive	131	10,765	37	3,318	−69
Public Utilities	15	16,668	27	33,761	+103
Process Industries (a)	161	80,965	141	68,432	−15
Food Industries (b)	241	35,614	114	15,023	−58
Metal Refining and Rolling	8	18,370	7	1,507	−92
Metal Working Plants					
1. Auto Factories	16	19,395	3	550	−97
2. Aircraft Factories	1	40	3	1,617	+3943
3. Foundries	4	410	5	1,084	+164
4. Mach. and Mach. Parts	179	24,112	85	37,696	+56
Radio	1	200	2	250	+25
Textiles (Excl. Rayon)	25	2,724	17	1,771	−35
Wood Industries	22	2,017	15	2,248	+12
General Factories	304	37,486	156	18,471	−51
Refrigeration & Cold Storage	29	3,403	11	1,251	−63
Total	1.145	$253,912	640	$190,779	−25%
In 1946 Construction $	.....	$253,912	...	$159,000	−37%

Backlog of Proposed Construction—Industrial Buildings

Projects recorded by *Engineering News-Record* $55,000 and over in size

Dec., 1945 $1,331,278,000	Dec., 1946 $2,402,019,000
Mar., 1946 $1,566,638,000	Mar., 1947 $2,769,776,000
3 months increase $235,360,000	$367,757,000 +56%
In 1946 Construction Dollars	$306,000,000 +30%

Advance to active status Jan.–March 1946 $108,759,000
Jan.–March 1947 $103,420,000



On this Camden, N. J., Overpass, saw-tooth faces of Atlas White Reflecting Curb are alternated in 10-ft. sections for either inbound or outbound traffic. Designed by N. J. State Highway Department. General contractor, Francis A. Canuso & Son, Philadelphia; curb sub-contractor, Frapaul Construction Co., Rochelle Park, N. J.

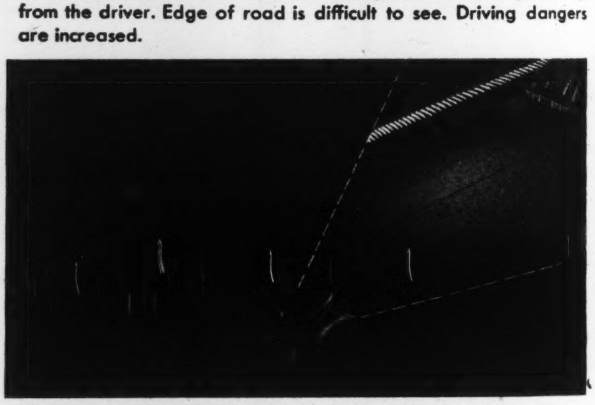
As One-Way Traffic Alternates . . . So Does CURB VISIBILITY

One-way traffic alternates on this overpass . . . moving inbound, toward Philadelphia, when peak load is in that direction; reversing, outbound, at other hours.

Either way, night or day, driving is made safer . . . because both sides of the road are edged with Atlas White Reflecting Curb. Its saw-tooth faces are placed in 10-ft. sections which alternately face inbound and outbound traffic. Thus, no matter which way traffic flows, saw-tooth faces catch the headlights' rays, reflect them back to the driver and form a highly visible traffic guide.

Reflecting Curb, made with Atlas White Cement, promotes safety on any highway. Send for further information. Write to Atlas White Bureau, Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Bldg., New York 17, N.Y.

A smooth curb wastes the car's headlights. It reflects light away from the driver. Edge of road is difficult to see. Driving dangers are increased.



White Concrete Reflecting Curb utilizes the car's headlights. Saw-tooth faces mirror the light back to driver, form a continuous bright ribbon of light at the road's edge. Driving is safer.

ENR-RM-49

A UNIVERSAL ATLAS PRODUCT

ATLAS WHITE CEMENT

For White Concrete Reflecting Curb

"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel—Sunday Evenings—ABC Network*

News of the Week

ENGINEERING NEWS-RECORD • APRIL 17, 1947 • VOLUME 138 • NUMBER 16

Bill would cut PRA right to obligate highway funds

House bill prohibits commitment of federal-aid money ahead of actual Congressional appropriation — Public Roads Administration protests new restriction

A bill that would severely limit the power of the Public Roads Administration to commit federal highway funds in advance of Congressional appropriations was introduced in the House last week.

The measure (H. R. 2840) is peculiarly aimed at highway work, since other government agencies now are required by law to wait for actual appropriations before they can make any commitments of funds.

If the measure is passed, the Public Roads Administration will not be permitted to enter into contracts with the state highway departments in amounts beyond the federal-aid money actually appropriated up to that date by Congress. It would stop procedure that has resulted to date in PRA's entering into contracts requiring about $350,000,000 of federal aid money, although total funds actually appropriated by Congress under the Federal-Aid Highway Act of 1944 total only $135,000,000.

Provisions of bill

Only one paragraph in length, the bill provides:

". . . that in the administration of the Federal Aid Highway Act, as amended and supplemented, and of any other law relating to the granting of aid by the federal government in the construction, reconstruction or improvement of highways and roads, no officer or agency of the United States shall take any action after the date. . . of this act, which results in obligating the federal government to make any payment with respect to any project, as its proportional contribution or prorata share of the cost of such project, of any sum in excess of that part of the amount appropriated for . . . highways and roads which is available for such project."

Introduced by Rep. Richard Wigglesworth of Massachusetts, the measure has been turned over to the subcommittee on roads of the House Committee on Public Works, and no hearings have been scheduled. However, PRA has been asked for comments on the proposal.

PRA opposes change

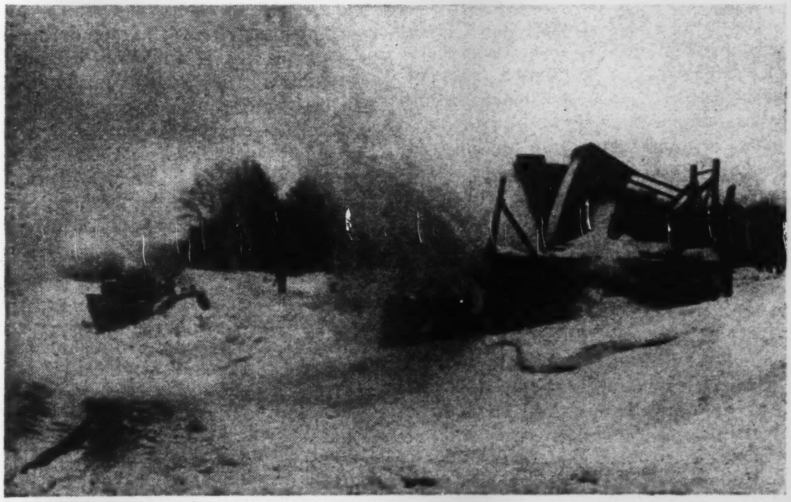
Although Commissioner Thomas H. MacDonald of PRA said his office had not had time to prepare a formal statement on the matter, he told newsmen that his organization is "very much against" the measure.

"To carry out a federal-aid highway program with the speed and skill that is now needed," Mr. MacDonald said, "would be impossible under this new procedure. Highway construction is a special case, in that the state highway departments put up at least 50 percent of the cost of the jobs—while with much other government work, the local groups put up little if any of the cost of the project.

"Additionally," Mr. MacDonald added, "the highway departments actually do the construction work, and PRA reimburses them as construction contracts are carried out. Other government agencies award contracts directly, in their fields."

Time needed for planning

Mr. MacDonald also stressed that state departments must have sufficient time for planning, and said such planning is only possible when the state agencies know that they are going to receive federal aid on a "clear-cut formula, such as that now followed", instead of a procedure that might favor the states that rushed to get their projects under contract.



Where's Spring?—Michigan highway department maintenance workers, after bucking what has been called their worst winter in 20 years, piling up drifts like that above, are glad to see the season move towards warmer weather. Commissioner C. M. Ziegler last week estimated snow removal (not including a heavy blizzard March 25) cost counties, cities and the State of Michigan well over $11,000,000 during the past winter.

NEWS IN BRIEF

In telegraphic form, here are latest news developments on the engineering and construction front during the week.

Construction—Kroger Grocery and Baking Co. will spend $750,000 on a bakery, warehouse and garages at *Charleston, W. Va.* . . . Ford Hotels Co., Inc., will build a 1000-room hotel at Delaware Ave. and Huron St., *Buffalo, N. Y.* . . . The Pet Milk Co. is building a $1,500,000 plant in *Washington, Ga.* . . . Several large industrial projects have been announced recently for Washington state, with the Harbor Plywood Corp. of *Hoquiam* planning an expenditure of at least $3,000,000 for a plywood and door plant, shingle and sawmills, and the St. Regis Paper Co. of *Tacoma* receiving CPA approval for building work involved in a $4,135,000 paper mill. . . . Supplee-Wills-Jones Milk Co., has plans for a $1,500,000 milk processing and distributing plant at *Oakmont, Pa.* . . . *Defiance, Ohio,* will build a $500,000 hospital. . . . The 18 major utilities companies of *Wisconsin* plan to spend $54,416,525 for new construction, maintenance and equipment . . . *Port Washington, Wis.*, is the site for a new 80,000 kw. power plant to be built by the Electric Co. of Milwaukee, to cost $11,000,000 . . . *Salina, Kan.*, has approved a $1,250,000 bond issue for several modern school buildings.

Highways—*South Dakota* has a highway program for 1947 involving about 524 miles at an estimated cost of $6,345,546 . . . A $300,000 testing laboratory for the state highway department of Mississippi will be built at *Jackson* . . . The *Pennsylvania* highway department has recommended for award 41 road contracts calling for the expenditure of $14,334,327. It will also build 118 bridges. . . . Bids for reconstruction of three railroad bridges and two highway bridges over the Puyallup River at *Tacoma, Wash.*, have been called by Col. L. H. Hewitt, Seattle District Engineer, Corps of Engineers. An appropriation of $1,112,500 is available.

Housing—Home building construction costs in *Canada* rose 7 per cent last year . . . The first houses to be constructed in *Boston, Mass.*, under the the $10,000,000 veterans' housing loan will cost about $15,780 each. They will be of the 2-family type . . . Plans for a $2,688,000 project of 384 homes on a 94-acre tract at *Pasadena, Tex.*, are announced by J. W. Anderson and Herbert Tatar . . . Several multiple housing developments have been announced at *Seattle, Wash.*, Modern Home Builders planning a $1,500,000 project on Beacon Hill and Edgar Johnson a similar development in Laurelhurst. . . . A development of 101 homes valued at $1,200,000 will be built in *Elsmere, Del.*, by the Johnson Development Co.

Special bargaining for professionals

Professional employees will determine for themselves whether they wish to be included in a collective bargaining unit with non-professional workers, if a proposal under consideration by the Senate's Labor and Public Welfare Committee becomes law.

This option is allowed the professional employee in a tentative draft of a revised Wagner Act, released to the press by Sen. Robert A. Taft, committee chairman. Little opposition to this phase of the new bill was expected, inasmuch as the National Labor Relations Board claims to be following such a policy now.

Although no provision is made for registration or licensing, the proposal is acceptable to the engineering groups that testified before the Senate committee last month (*ENR* March 13, vol. p. 405) in support of special consideration for professional workers.

Taft's bill would insert into the Wagner Act a definition, now lacking, of "professional employee." It would provide that NLRB could not determine that a unit is appropriate for bargaining purposes if it includes "both professional employees and employees who are not professional employees, unless a majority of such professional employees vote for inclusion in such unit."

It defines a professional employee as:

"(A) Any employee engaged in work (1) predominantly intellectual and varied in chacter as opposed to routine mental, manual, mechanical, or physical work; (2) involving the consistent exercise of discretion and judgment in its performance; (3) of such a character that the output produced or the result accomplished cannot be standardized in relation to a given period of time; (4) requiring knowledge of an advanced type in a field of science or learning customarily acquired by a prolonged course of specialized intellectual instruction and study in an institution of higher learning or a hospital, as distinguished from a general academic education or from an apprenticeship or from training in the performance of routine mental, manual, or physical processes; or

"(B) Any employee, who (1) has completed the courses of specialized intellectual instruction and study described in clause 4 of paragraph A, and (2) is performing related work under the supervision of a professional person to qualify himself to become a professional employee as defined in paragraph A."

◆

St. Lawrence seaway remains a live issue

April 8 President Truman withdrew the treaty agreement of July 18, 1932, between the United States and Canada for completion of the Great Lakes-St. Lawrence sea and power project, but this action, which simply kills an old treaty that failed to receive the necessary two-thirds vote of the Senate in 1934 does not mean that the project is a dead issue.

Since Canada and this country on March 19, 1941, reached another agreement, the project, the seaway could be built by placing this latter agreement into effect. Two bills (H. R. 13 and H. J. Res. 132) permitting the development to go ahead by making this last agreement effective are now before the House, both calling for a study of the possibility of making the project self-liquidating by sale of power and the collecting of tolls.

Senator Aiken of Vermont has indicated that a similar proposal will be put before the Senate soon. However, the chances for early approval appear slim, since no hearings have been held on either bill. A detailed description of the project and the 1941 agreement was published in *Engineering News-Record*, May 22, 1941, vol. p. 824. Most of the remaining work would be done by the Corps of Engineers, U. S. Army. The corps early last year (*ENR* March 7, 1946, vol. p. 325) reported that revised estimates indicated that $455,000,000 would be needed to complete the seaway.

Correction

An item in *ENR* Apr. 3, vol. p. 494, concerning the construction of a plant for the Century Electric Co., St. Louis, Mo., erroneously named the Thomas J. Sheehan Co. of St. Louis as general contractor.

The Sheehan Co. has a contract for plumbing work, and the general contract is held by the Gamble Construction Co., 804 Pine St., St. Louis.

Labor wage disputes hamper construction

Legislation aimed at curbing unions' power pushed in states as pay demands increase

Although its activities were overshadowed in the last week by those of organizations such as telephone and coal mine workers, construction labor continued its agitation for higher wages and easier working conditions.

A direct result of the telephone strike which may also affect construction workers was a law pushed through the New Jersey legislature virtually overnight at the request of Gov. A. E. Driscoll to "put teeth" into an existing state law permitting seizure of struck utility plants. The law calls for a mandatory 60-day cooling-off period before strikes in vital public utilities, during which direct bargaining and mediation are to be carried on; followed by compulsory state arbitration and state seizure if no agreement is reached voluntarily. It provides fines of $10,000 a day for noncompliance by either management or unions, and fines of $250 to $500 and imprisonment up to 30 days against individual strikers.

In Texas, the state legislature approved and forwarded to Governor Beauford Jester two measures to prevent disruption of service in gas, water and electric utility organizations.

The Delaware legislature passed a Labor Disputes Act—a far reaching control measure providing among other things that employers may refuse to grant a closed shop; outlawing secondary boycotts, sitdown or slowdown strikes; making mass picketing and unrestricted picketing unlawful, and placing a $25 ceiling on union initiation fees.

In Arizona, however, Gov. S. P. Osborne vetoed a bill outlawing secondary boycotts on the ground that the legislation was "one-sided."

Some disputes settled

Some labor disputes were settled during the week, the most notable action being at St. Louis, Mo., where AFL carpenters agreed to continue their present $1.95 per hour rate for journeymen for another year, in order to hold down the cost of home construction. However, the Carpenters' District Council informed contractors that it would demand $2.20 per hour for its members employed on other than private residential construction.

At Stamford, Conn., a week-old strike in the building trades was settled when laborers and contractors agreed on a 15 percent wage boost which brought pay to $11.50 for an 8-hour day, and carpenters, painters and bricklayers accepted offers of 10 to 13 percent rises, respectively.

More than 75,000 heavy construction workers in western Pennsylvania were granted a 20-cent hourly wage increase under a contract completed and signed at Pittsburgh.

About 75 percent of all construction activity in the Kanawah River Valley of West Virginia was at a standstill while contractors and union representatives met in Charleston in an attempt to settle wage increase demands by the unions. A dispute over wages paid common labor caused a 2-day stoppage of construction at Albuquerque, N. M. It was settled when laborers were granted 90 cents per hour. In the New York metropolitan area, contractors estimated that several hundred homes under construction in suburban Long Island were delayed by a strike of painters who sought $2.50 per hour.

Flood Scene—*Typical of areas inundated by general floods throughout the midwest recently was this highway on the outskirts of Chicago, Ill., where swollen streams left a highway bridge high and dry, but flooded approaches.*

Record floods occur on midwest rivers

During the last week several rivers in the north-central section of the country have been in flood stage because of heavy rains and at some points record stages have occurred. The area most severely affected extends from Kansas, Missouri and Iowa, eastward across northern Illinois and Indiana, southern Michigan, northern Pennsylvania and southwestern New York.

Southern Michigan was hardest hit with record stages exceeded in the Saginaw and Grand River basins and other small streams. At Lansing, the Grand River crested 17 ft. on April 7, exceeding the 16.7 ft. record stage in 1918 and the Red Cross had to evacuate over 300 families in that area. The Cedar and Flint rivers were also rising on April 7. At East Lansing, Mich., the Cedar River crested 13.6 ft., breaking a previous record of 12 ft. in 1918, and at Flint, the Flint River reached a height of 16.4 ft., or 5.2 ft. above the 1938 record. Downstream on the Grand River at Grand Rapids, Mich., a crest of 17.6 ft. was reached on April 9, coming within one foot of the record stage of 18.5 ft., established in 1907.

The Mississippi River is above flood stage from Keokuk, Iowa, to Grafton, Ill., and at Quincy, Ill., the Mississippi crested 18.8 ft. on April 7, thereby exceeding the 14-ft. flood stage. The Illinois River and the lower Rock River in Illinois are also in moderate flood. The Ohio River is well below flood stage except at Cairo, Ill., where slightly above flood stage (40 ft.) is indicated.

In the Missouri River basin, flooding was confined largely to the Osage River above the Kansas-Missouri line with moderate overflow; the Grand River in Missouri with severe overflow at Chillicothe, Mo., which is now falling, and light to moderate overflows in the lower Missouri River from Waverly, Mo., downstream.

Flash floods swept through communities in western and northern Pennsylvania, destroying a total of 34 state bridges, with an estimated replacement cost of about $150,000. Warren, Pa., suffered the worst flood in its history, when the Allegheny River and Conewango Creek spilling over their banks and covering parts of the city's business district three to six feet deep.

In southwestern and central Ontario, Canada, many smaller communities were flooded as the Thames River and a series of smaller streams swelled over their banks.

HIGHLIGHTS OF MUNICIPAL DEVELOPMENTS

Automotive Safety Foundation to survey Richmond, Va., expressway plans—Pittsburgh, Pa., to spend $4 million on airports—Streets, sewer, water projects planned

Following up its offer of a few weeks ago to engage disinterested engineers to survey the city's proposed expressway plans, the Richmond, Va., *Times-Dispatch* last week announced that the Automotive Safety Foundation, Washington, D. C., had assigned members of its staff to the work.

The newspaper had offered to hire outside engineer experts at its own expense to settle a current controversy over plans to put an expressway through the city's heart, and a city council committee in an unprecedented action agreed to the plan (*ENR* April 3, vol. p. 494) as a preliminary to its own action in the matter.

The ASF study of the proposal is under the direction of G. Donald Kennedy, former Michigan highway commissioner, and now vice-president of the foundation in charge of its highways division. Carl E. Fritts, formerly with the Washington State Highway department, and D. Grant Mickle, former Detroit, Mich., traffic engineer, have been assigned by the foundation to make the study under Mr. Kennedy's supervision.

The investigation is the first undertaken by ASF at the request of a newspaper or civic organization. In the past, foundation engineers have worked only with federal, state or local officials.

Other street plans

Other municipal highway and street improvement projects reported during the week included:

The Florida State Road Department received proposals from officials of St. Augustine for a "scenic route" along the city's shoreline to form a part of a new superhighway planned for the state's east coast; voters of Anchorage, Alaska, approved a $2,325,000 bond issue which will include funds for street repairs; Elmira, N. Y., residents were warned that many city streets would be torn up to permit installation of new underground utility lines, storm sewers and the like.

Pittsburgh airport

Construction work at the Greater Pittsburgh, Pa., Airport, proposed for 1947, will total more than $4,000,000, according to a schedule presented to Allegheny County commissioners.

Included in the plan is a huge central terminal building that will include offices, restaurants and even a night club; and a 4-lane express highway to connect the airport with downtown Pittsburgh. Contracts for part of the highway work have already been let and the work is expected to be completed late this year.

Sewerage plans

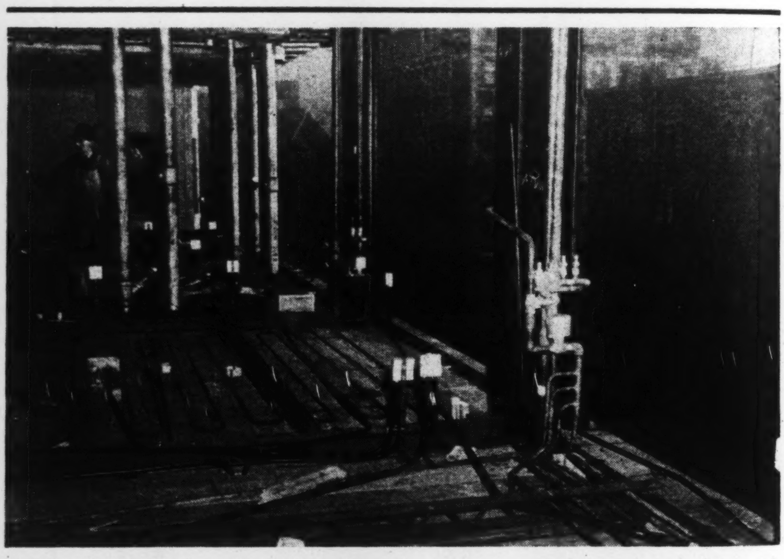
Active plans for construction of new sewerage systems continued to hold an inportant place in municipal affairs during the week. Miami, Fla., sent a delegation of engineers and city officials to New York to discuss the employment of an engineer to design and direct construction of a proposed $10,000,000 disposal system, and Tampa, Fla., awarded a design contract for a $6,000,000 disposal project to the Chicago firm of Greeley and Hanson.

The Spokane, Wash., city council approved plans for a $2,250,000 intercepting sewer project; and Salt Lake County, Utah, commissioners approved the employment of the local engineering firm of Caldwell, Richards and Sorenson to supervise a proposed $2,750,000 county sewer system project. At Douglas, Ariz., the new Douglas-Agua Prieta sewage disposal plant was dedicated; Tyler, Tex., citizens approved a bond issue of $250,000 for sewer extensions; and Bedford, Ind., announced that, because of high costs, it would not comply at this time with state orders to construct a new disposal plant on the White River. At Louisville, Ky., city councilmen considered extra sewerage under proposals to annex 24 sq.mi. of new area to the city.

New engineer post

At the request of City Engineer Walter N. Frickstad, the Oakland, Calif., city council recently approved creation of the post of office engineer, with a starting salary of $495 per month.

Temporary appointee named is Edward W. Ziegler, who has been with the department for the last 22 years. Mr. Ziegler was promoted from his post as engineer in charge of maps and records. Increased activity in Oakland's sewer and highway programs was cited by Mr. Frickstad as the reason for additional personnel.



***Radiant Heat for Apartments**—Apartments now being erected in midtown Manhattan, New York City, have steel pipe embedded in the ceiling to circulate hot water for radiant heating in most rooms. In bathrooms the coils are placed under the tile floors. Floors are generally 5-in. thick concrete, with the pipe 1/2 in. above the bottom, and are surfaced below with plaster and on top with 1/2 in. of sound deadener and 3/4 in. of wood parquet. Provision is made for temperature regulation by the tenants. Installation was made by J. L. Murphy, Inc., heating contractors. Walter D. Binger is engineer and vice-president of City Investing Co., New York City, the owner.*

Random Lines from an editor's notebook . . .

In which the executive editor reports on Davis Dam, and the expenses of eating an sleeping in the southwest.

Davis Dam, Ariz.—There wasn't much activity at the Davis Dam site when we arrived. And there were quite a few unoccupied tables in the messhall operated by the Utah Construction Co., contractors on the project. In fact, there were only about 400 men on the payroll, compared to some 1,200 a couple of weeks ago.

All of which, to the casual observer, might have provided substance for the rumors flying around that Davis Dam—biggest single construction project that the Bureau of Reclamation has under way—was to be abandoned.

"Nothing could be further from the truth", stated H. A. Bahmeier, the bureau's construction engineer in charge of the project. He then explained what had occurred and why a board of consulting engineers had been called in to make a special report on foundation conditions.

After months of excavation, during which some 2¾ million cu. yd. of rock had been taken out, the conditions exposed at the foundations for the powerhouse, intake structure and concrete spillway were somewhat different than anticipated on the basis of preliminary explorations.

Although the consulting board's findings have not yet been made public, engineers of the Reclamation Bureau point out that the rock exposed by excavation is severely jointed and crossed by numerous gouge-filled faults. At one point, where a rhyolite dike intrudes into the basic gneiss foundation of this area, there is contact zone of soft clay some 8 to 12 in. thick.

On the basis of these disclosures it will be necessary to redesign and shift the location of the powerhouse, intake and spillway structures. But there will be no changes in the original plans for the 140-ft. high earth and rockfill dam.

It is estimated that the changes may add another million dollars to the cost of the job, which would be about two percent of the anticipated cost.

As for the contractor's activities, Mr. Bahmeier points out that the Utah Construction Co. has been as much as 84 days ahead of schedule. With major excavation completed, the contractor is now converting his operations to undertake concreting. This explains why a temporary layoff of help has taken place. Despite present curtailment of construction due to the changeover, the Utah company's progress under the management of H. C. Williams, is still two months in advance of anticipated progress.

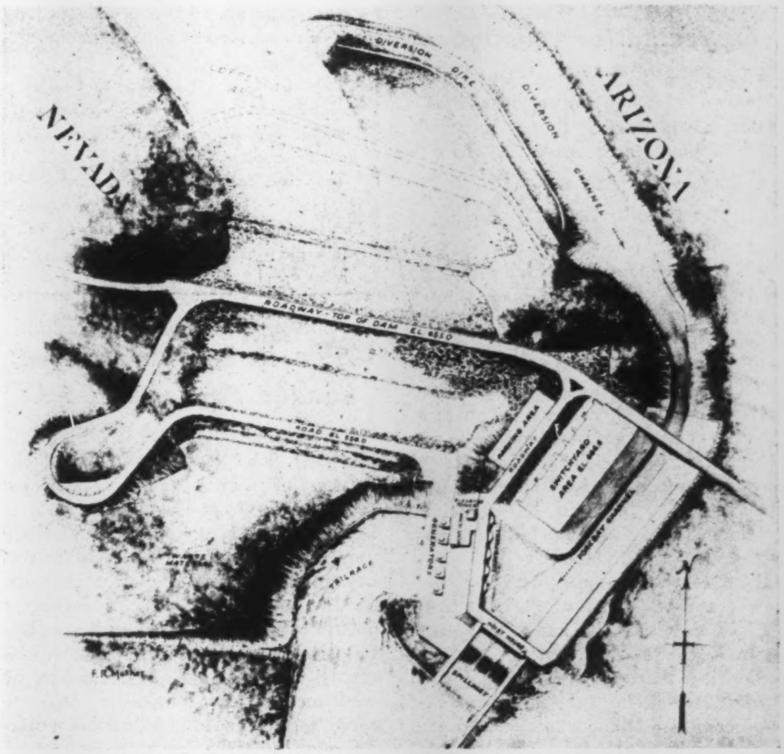
Life in the desert

But if anybody is under delusions about difficulties at Davis Dam, they should have been in Palm Springs, Calif., last Saturday night. This desert oasis for overworked movie people, I should hasten to explain, is not a rendezvous for engineers. However, it is only a short distance from the terminal point of the Coachella canal project of the Bureau of Reclamation. And after a week in the desert, what better place than Palm Springs for an engineer to stop and wash out the alkali dust?

It was here that we learned about picture-producer Darryl F. Zanuck's troubles. According to the local press, it seems that Mr. Zanuck was throwing a weekend party for some 40 guests from Hollywood. And the lamentable fact was that he didn't have sleeping accommodations for such a crowd. But with true hardihood and a dash of devil-may-care spirit, some of the guests came fully equipped with sleeping bags!

All of this may sound like incidental intelligence, entirely unrelated to my reconnaissance of reclamation projects. But it does have a point.

My companion on this trip was Jack Shankland, an engineer of the construction division of the Bureau of Reclamation. Like every other government employee, he receives a per diem traveling allowance of $6 a day. This might have been a fair deal some years ago. But with the simplest tourist court accomodations at $3.50 a night (if you can find a vacancy—otherwise a regular hotel at higher rates) and the minimum in meals at about $3.80, Jack is not doing too well financially on this trip. At an Army surplus sale yesterday, therefore, I picked up a sleeping bag. I'm giving this to Jack with the compliments of *Engineering News-Record*. With this sleeping facility, and the example set by the folks in Hollywood, he may be able to break even on his per diem when he starts the long trek back to Boulder City headquarters.—*E. J. C.*



***As Planned**—Map shows Davis Dam, near Kingman, Ariz., with original planned location of powerhouse, intake and spillway structures. Excavations which exposed faulty rock will make redesign of these locations necessary, says ENR editor.*

West Coast lumber firm announces price cuts

The first break in west coast building costs came April 2 when E. K. Wood Lumber Co. announced cuts of about $10 per 1000 bd. ft. in retail prices of all lumber in its 15 yards.

J. B. Wood, vice-president, reported in Oakland, Calif., that the cut will come entirely from the firm's profit margin, with no reduction in wages or restriction of service. He said, "Prices have been going up too long—lumber, especially, has reached a price peak. We thought it was about time building costs started to go down." He added that President Truman's stand against inflation had contributed to their decision.

Representative cuts in the company's prices were: 1x6 #2 common and better, $90 to $82 per 1000; 1x3 Douglas fir B and better, sash grain, kiln dried, $175 to $160 per 1000; 1x12 #3 common, $78.50 to $70 per 1000.

The Wood company has an annual sales volume of 100,000,000 bd. ft., owning mills at Reedsport and Roseburg, Ore.

Union rail terminal suggested for Chicago

Urgent necessity of coming to a decision soon regarding unification and relocation of Chicago railroad terminals south of the Loop suggests that the city revive its 1944 plan for a public authority for the project, according to Joshua D'Esposito, Chicago engineer, representing the mayor on the railroad engineering committee which has been studying the problem for more than a year. He gave his opinion April 9 at a meeting of the Illinois Section, American Society of Civil Engineers.

To avoid undue delay in planning of related public improvements, such as the Congress St. expressway, it is imperative that a decision on adjustment of passenger and freight terminals and trackage south of Van Buren St. be reached as rapidly as possible, Mr. D'Esposito explained.

Four separate passenger terminals now are used by 17 of the rail lines. Freight terminals, he asserted, present an even greater problem.

Looking back to the Union Station project, which he supervised as chief engineer, Mr. D'Esposito recalled that it took eight years, from 1906 to 1914, for four railroads to get together in an area only one-fifth the size of the one now under consideration. In his opinion, the railroads are no longer in position to pay as they once did for construction of streets, ramps and other public facilities incident to such a project.

The railroad terminal committee composed of officials of the railroads involved has created an engineering committee headed by R. E. Dougherty, vice-president and chief engineer of the New York Central, which has made an intensive study under the direction of C. P. Richardson, terminal engineer. Three plans for passenger terminal unification have been proposed.

To get the action needed, Mr. D'Esposito suggested creation of a public authority by the state legislature with power to issue bonds and construct rail, bus, truck and, possibly, air terminals. This would be like a publicly-owned business enterprise, because it would receive no support from general taxes.

Mayor Edward J. Kelly supported Mr. D'Esposito's opinions, saying that he wanted to see the project go ahead in the best way it could be done—by the railroads, by a public authority, or by a body with the railroads as members.

RARA AVIS

The Philadelphia, Pa., Department of Public Works set a $4,000,000 figure for its Northeast sewage disposal treatment works project.

To the amazement of Thomas Buckley, works director, the low bid was almost $500,000 under the amount estimated by the city officials.

The city lost no time awarding the contract to the low bidder the Virginia Engineering Co., Newport News, Va., whose bid was $3,543,951.

Adm. H. R. Stanford dies, headed Yards and Docks

Rear Admiral Homer R. Stanford, USN, 81, who served as chief of the Bureau of Yards and Docks, Navy Department, from January, 1912, to December, 1915, died April 7 at Bethesda, Md. Born at Alton, Ill., he was a graduate of Washington University, St. Louis, Mo., and held a degree of doctor of engineering from Rensselaer Polytechnic Institute. Admiral Stanford retired in June, 1929, after which he was recalled to temporary duty to serve on the selection board for recommending CEC officers for promotion. In 1940 he wrote a history of the Potomac River, which dealt principally with the early struggle to build a freight canal between tidewater and the frontier settlements.

Delaware provides new funds for river bridge

As a result of legislation just passed, Delaware now has a law authorizing an increase to $40,000,000, from the previously authorized $25,000,000, in a bond issue to finance construction of a 6-lane bridge to span the Delaware River below Wilmington, linking Delaware and southern New Jersey (ENR Oct. 3, 1946, vol. p. 422).

With the bond issue now a reality, the next step will be awarding the contract to engineers. Bids will be mailed within the next two weeks from the office of Gen. Eugene Reybold, head of the Delaware River-Crossing Division of the State Highway Department.

General Reybold said that, upon the awarding of the contract in approximately 30 days, new borings will be taken of the river bottom to determine the type of foundations necessary.

Other construction plans

Another new state law authorizes the appropriation of $2,500,000 to the State Highway Department, for which bonds will be issued, for a general highway construction program.

Also approved is a bill creating a State Health and Welfare Center at Fort DuPont, near Delaware City, now the property of the state, and authorizing the expenditure of $1,250,000 by the board of trustees of the Delaware State Hospital for the renovation, equipping, and operation of that center for the next two years.

Senate sets hearings on pollution bills

The Senate Public Works Committee April 8 announced that open hearings would begin April 22 on S. 418, the water-pollution control bill now before Congress (*ENR* Feb. 27, vol. p. 336). The several bills on pollution control that were introduced in the House have not been acted upon, and no date has been set for hearings on any of these measures.

S. 418, which is similar to H. R. 123, H. R. 315, and H. R. 470, places water pollution control activities of the federal government in the hands of the U. S. Public Health Service. It sets up machinery for this agency to carry out an extensive survey and study of the problem, and empowers the Federal Security Agency, of which USPHS is a part, to extend federal aid up to $100,000,000 yearly to state and local governmental groups, plus $1,500,000 yearly for studies and planning.

OBITUARY

Ernest Flagg, 90, architect, died in New York April 10. In 1908 he designed the 41-story Singer Building at Broadway and Liberty St., one of New York's early skyscrapers and for years the world's tallest building, whose unique wind-bracing, largely concentrated around the elevator shafts, was designed by the structural engineering firm of Boller, Hodge & Baird. In his early days Mr. Flagg was one of the pioneers in urging lighter walls, partitions and floors for apartment housing.

Among the other well-known buildings designed by Mr. Flagg are the St. Luke's Hospital in New York, the Corcoran Gallery of Art in Washington, and early buildings of the U. S. Naval Academy at Annapolis, Md.

Charles Emmett Wilkins, 65, of Seattle, Wash., for many years on the staff of the King County engineer, died there March 31. He had been employed as court engineer, office engineer and in the drafting department.

Lloyd L. Eller, 52, civil engineer of Spokane, Wash., died there April 6. He worked for the the city engineering department between the two world wars, serving in the first one and working as a federal engineer in California during the second. He returned to Spokane in 1944 to open a private practice.

Thomas E. Helmer, 84, retired civil engineer, died April 9 at Ladue, Mo. A native of Munich, Germany, Mr. Helmer was a graduate from the St. Louis University school of engineering, and practiced as a civil engineer for 45 years until his retirement about 15 years ago.

William Curry, 92, who had built over 1,000 houses and other buildings in Cape Breton Island died at Glace Bay, N. S., March 26.

Stanley H. Howard, 60, a structural engineer for the Hercules Powder Co., died March 28 at Philadelphia, Pa. He had been with Hercules for ten years.

Franklin Ernest, Jr., 58, a civil engineer for the West Jersey Tile and Guarantee Co., Camden, N. J., died March 31 at Collingswood, N. J.

Richard G. Develin, 80, a civil engineer employed by the Pennsylvania Railroad until his retirement more than 15 years ago, died March 24 at Moorestown, N. J. He was a graduate of the University of Pennsylvania school of engineering, class of 1890.

Guy R. Balloch, 75, died at Woodstock, N. B., March 28. A graduate of McGill University engineering school, he was with the Canadian Pacific Railway in exploring, locating, and construction, for some years, and later with the Grand Trunk Pacific Railway. Following which he was with the Canadian National Railways on bridge construction, and still later on construction work for the Cuban Central Railway for two years.

Roger Wrigley, 86, who retired in 1935 as superintendent of construction for Charles T. Wills, Inc., New York construction engineers, died April 8. Employed with the Wills concern for 26 years, Mr. Wrigley had been superintendent of construction on important building contracts in the metropolis.

James L. Tighe, 83, sanitary and hydraulic consulting engineer, and one of the oldest engineers in the country actively engaged in practice, died recently at Holyoke, Mass. He was head of the consulting engineering firm of Tighe and Bond, Holyoke, and had been associated with the design and construction of many dams, hydraulic plants and sewerage systems in New England, and recently designed a sewage disposal system for Athol, Mass.

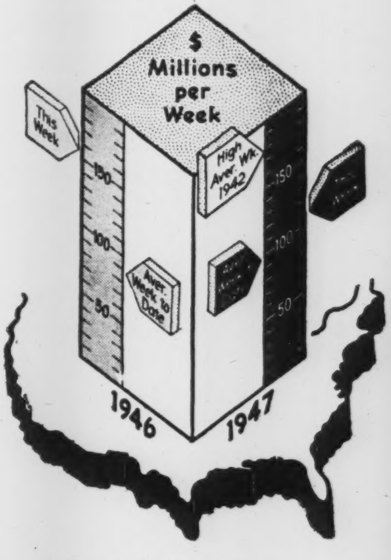
H. J. Donovan, 45, former division engineer with the North Dakota state highway department at Minot and Grand Forks, died recently at Seattle, Wash., while awaiting passage to Kodiak, Alaska, where he was to be employed by the Puget Sound Construction Co.

Elmslie G. Higginbotham, 80, service engineer of the Virginia State Highway Department, died at Richmond April 5. He had been with the department for the last 25 years.

Morris D. Anderson, city engineer of Salinas, Calif., for four years, died March 31. Formerly he was a testing engineer for the Nevada highway department, and at one time he had charge of construction of the Walker River Dam. He was graduated from the University of Nevada in 1913.

Asa C. Barrow, 70, engineer with the Kentucky State Highway Department, died at Lexington, March 30. He had been in the bridge designing division for two years and during the war was on several construction jobs for the federal government.

CONSTRUCTION ACTIVITY



As Reported this week to . . .
Engineering News-Record

CONTRACT VOLUME

Continental U. S. Only
(Thousands of Dollars)

	Week of Apr. 17 1947	Cumulative 1947 (16 wks.)	Cumulative 1946 (16 wks.)
Federal	$12,373	$142,828	$152,505
State & Mun.	28,846	445,302	314,361
Total Public.	$41,219	$588,130	$466,866
Total Private	68,872	965,797	918,013
U. S. Total	**$110,091**	**$1,553,927**	**$1,384,879**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Dollar Volume (Thousands)

Type of Work	This Week	Cumulative 1947 (16 wks.)	Cumulative 1946 (16 wks.)
Waterworks	$1,424	$41,841	$32,461
Sewerage	2,730	28,685	17,928
Bridges	5,333	45,563	32,067
Highways	12,155	186,220	166,499
Earthwork, Waterways	7,973	74,590	85,684
Buildings, Public.	9,475	151,924	94,918
Industrial	17,266	250,223	316,770
Commercial ...	47,687	592,176	537,552
Unclassified	6,048	182,705	101,000

NOTE: Minimum size projects included are: Waterworks and waterway projects, $22,500; other public works, $40,000; industrial buildings, $55,000; other buildings, $205,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1947 (16 wks.)	Cumulative 1946 (16 wks.)
NON-FEDERAL	$493,655	$265,588
Corporate Securities.	184,438	106,737
State and Municipal.	309,217	158,851
FEDERAL	......	158,320
Total Capital..........	**$493,655**	**$423,908**

ENR INDEX NUMBERS

Index Base = 100	1913	1926
Construction Cost. Apr. '47	396.09	190.40
Building Cost.... Apr. '47	300.81	162.61
Volume .... Mar. '47	220	96

EDITORIALS

VOLUME 138 NUMBER 16

April 17, 1947

Independent Bargaining

WHEN the American Society of Civil Engineers undertook to sponsor independent collective-bargaining groups for engineers a few years ago as an alternative to joining unions in which they would have little voice or whose methods they did not like, many engineers predicted that the plan would not work. They now have their answer in several places, a conspicuous example being the Seattle Professional Engineering Employees Association, which has nearly 1,000 members, as reported in the news pages of this issue. That association is now wholly on its own. It has not had smooth sailing, but it finally won recognition by the National Labor Relations Board, hence its status as an independent organization representing engineers is well established. The association set its standards high, including promotion on the basis of merit instead of seniority and a no-strike pledge during the life of a contract. The lesson to be learned from the Seattle experience is that independent bargaining can be conducted on a high plane and that independent groups can succeed under the right kind of leaders who get enthusiastic support from their members.

Sand Made to Order

THANKS to the development of equipment and of techniques in its use, many of the difficulties of concrete making that formerly originated with poor sand are being eliminated. Assuming the availability of sound rock, a sand can be manufactured that has the exact attributes that the mix designer seeks—durability, size gradation, angularity and freedom from organic matter. All this is demonstrated by the aggregate production plant used at Center Hill Dam, as described in this issue, where to the usual jaw and gyratory crushers are added such modern equipment as hammer mills, impactors, roll mills and centrifugal dust separators. Without question, this triumph of the equipment manufacturers' art has greatly advanced the art of concrete manufacture. Why, then, not make all sand to order, even though good natural sand is available? The answer is partly economic and partly technical. It is apparently still cheaper to dig sand than to make it, and there is a harshness to concrete mixes made with artificial sand that increases placing difficulties and costs over those encountered with natural sand concrete. Considering the progress already made in sand manufacture, even these disadvantages may be eliminated in time, by equipment improvements, by better operating techniques, perhaps by the growing use of air-entrained concrete to improve workability. In the meantime, however, the areas where good concrete can be made have been greatly increased through the ability to make good sand. The modern crushing plant is an important new tool of construction.

Improving Design Ability

THE THEORY that the more a designer knows about field operations and maintenance problems the better designer he will be is being put into practice in an effective manner by a mid-western city. Having completed one filtration plant and having another in the offing, the city has assigned its chief design engineer the task of assisting in the tune-up of the new plant. Here he will spend several months acquiring first-hand knowledge of the multitude of minor defects that cause difficulties and increase costs. It would be still better if he could work incognito, and thus hear the unexpurgated comments on his design by the operating staff, but even without this revealing testimony he will come away a better designer. And the second filter plant will be a more efficient unit than the first and perhaps less costly. Putting designers into the field occasionally is a practice that should be utilized much more widely than it is, as Fred D. Hartford of the PRA emphasizes in his article in this issue, "Lower Cost Bridges and How to Get Them." His principal thesis is that many dollars can be saved in the drafting room if the designer has a working knowledge of fabrication methods and erection requirements. This knowledge, of course, is most readily acquired in the shop and field. What is true of bridges is equally true of every other facility that the civil engineer is called upon to design.

Unsound Legislation

A BILL has been introduced into Congress that would end the present practice under which the Public Roads Administration is permitted to make firm commitments with the states for authorized federal aid for highway work before the money has been appropriated. Passage of this bill would be a step backward in sound planning for highway work. Under the method now being followed the states can plan their construction operations in an orderly fashion and can let contracts at the most favorable time even though actual appropriations for the federal share of the cost have not been made. Highways are such a vital part of our economic life that their planning and construction should not be subjected to any more obstacles and uncertainties than are necessary. They cost so much that the economies of a continuing program must not be tossed away. The present method of carrying forward the federal-aid highway work should be retained. The bill to change it should be scrapped.

Costs and Construction Volume

So FAR, construction volume has held up to the predictions made for it at the beginning of the year, but warning signals in the form of resistance to further increases in the level of costs are beginning to appear. On the favorable side, it may be noted that, for the first three months of 1947, the volume increase over the comparable months of last year for the types of work *Engineering News-Record* figures cover has been slightly more than 20 percent, dollar-wise. Even if the figures are examined more in detail, only two classifications of work show any reduction. Earthwork and drainage is down 60 percent compared to last year, largely as a result of reduced federal contracting for dams, flood control and irrigation; and industrial buildings are down 25 percent, a drop that may reflect resistance to costs, but also probably results from the fact that the comparison is made with the exceptional period of 1946.

A warning signal appears, however, when one translates the 20 percent dollar increase into physical volume. It is then apparent that almost the entire increase is accounted for by rising construction costs. On a physical construction basis we are just holding our own with last year.

Turning to the single "family" residence field brings another warning that needs no statistical legerdemain for emphasis. According to an ENR survey (April 3, 1947 vol. p. 489), out of 21 cities, located in every part of the country, only the two in the southeast region—Atlanta and Miami—could point to anything but substantial decreases in contracts awarded. Cause: People won't pay the asking prices for the quality of houses that are being offered.

That this house situation could spread to all types of construction should be a matter of concern to labor, construction management and manufacturers of equipment and materials. No opportunity should be missed to lower prices and costs, yet labor by continually pushing wage rates to higher levels and manufacturers by refusing to give firm quotations to materials purchasers are ignoring two very important ones. Construction management, caught between the uncertainties of such a situation, must continue to include large contingent items in its bids, which also adds to costs. We need the housing that is now being lost because of these high costs, and we will need the other types of construction that will be lost if the whole industry follows housing.

Against this background of rising costs and slowing construction, this annual Construction Costs Number of *Engineering News-Record* assumes a special significance. Trends, benchmarks and past movements of prices and costs are the principal working tools available to the estimator and planner to supplement his own experience. These data this issue attempts to provide. From them, from the accompanying articles and analyses and from current news developments, several significant facts emerge.

Improvements are beginning to show up in the conditions that originally forced costs up. A slight improvement in productivity of skilled labor and a considerable improvement in common labor productivity are apparent. The flow of materials is in better balance with immediate demand than at any time in recent years. A drop in steel prices continues to be rumored, contingent upon the outcome of portal-to-portal pay suits and new wage demands. If these favorable signs continue and multiply, there should result a lowering of construction costs during the second half of the year, and most important of all a stability in price levels that will permit construction planning to go ahead with confidence. If, on the other hand, the upward cost trend continues, construction volume will be sure to suffer—and with it wages, jobs and profits.

ENGINEERING NEWS-RECORD

Copyright, 1947, by McGraw-Hill Publishing Company, Inc.

WALDO G. BOWMAN, *Editor*, EDWARD J. CLEARY, *Executive Editor*
New York: V. T. BOUGHTON, R. K. TOMLIN, H. W. HUNT, E. E. HALMOS, JR., T. D. MacGREGOR, JOHN C. BUMSTEAD and F. S. MERRITT
Chicago: V. B. SMITH, *Cleveland:* J. R. CARR, *Washington:* A. N. CARTER, *San Francisco:* N. A. BOWERS, L. L. WISE

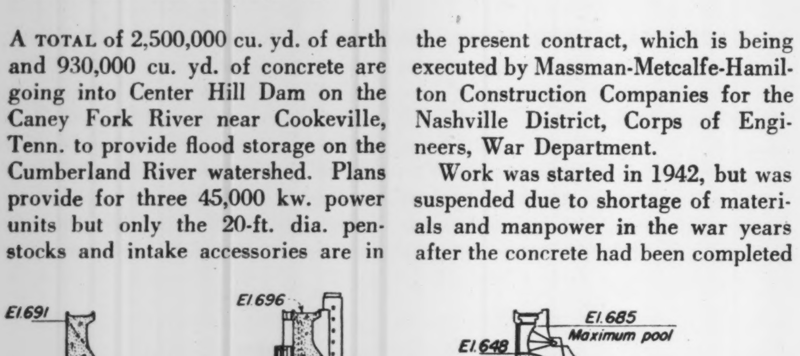
EDITORIAL OFFICES: 330 WEST FORTY-SECOND STREET, NEW YORK, N. Y.

Work Resumed on Center Hill Dam

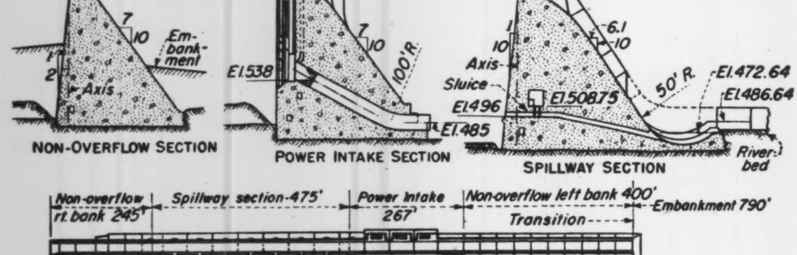
Contents in Brief—*Concrete placed by revolving cranes and earth loaded by a plow-type elevating unit are being used to complete Center Hill Dam in Tennessee after a war-time shut-down. Reinforced concrete columns 50 ft. high support the cranes, supplemented by side-hill gantries that work along the downstream face. Two following articles describe aggregate manufacture in an efficient plant at the dam site and moving of earth for the extensive fill sections required.*

A TOTAL of 2,500,000 cu. yd. of earth and 930,000 cu. yd. of concrete are going into Center Hill Dam on the Caney Fork River near Cookeville, Tenn. to provide flood storage on the Cumberland River watershed. Plans provide for three 45,000 kw. power units but only the 20-ft. dia. penstocks and intake accessories are in the present contract, which is being executed by Massman-Metcalfe-Hamilton Construction Companies for the Nashville District, Corps of Engineers, War Department.

Work was started in 1942, but was suspended due to shortage of materials and manpower in the war years after the concrete had been completed to above high water in the first of two cofferdams used for construction. The same contractor resumed work early in 1946 under a modified contract.



Typical sections and plan of Center Hill Dam. The non-overflow section at the right bank is built into a rock bluff. At the left, earth is packed around the non-overflow section and extends 790 ft. to a rock abutment.



Looking downstream on Center Hill Dam. The aggregate plant is in background.

Center Hill Dam is founded on excellent limestone rock at a maximum of about 30 ft. below the bed of the river. A concrete structure extends from the right bank (facing downstream) across the river channel and connects with an earthfill across the flood plain to the opposite side. There is a 245 ft. non-overflow section at the right abutment; eight 50 ft. long 37-ft. tainter gates across a 470-ft. spillway, a 267-ft. power-intake section, a 400-ft. concrete to earth fill transition, and 778 ft. of embankment to make a total crest length of 2,160 ft. It is estimated that using earth embankment for part of the structure saved a million dollars over all-concrete.

Large storage capacity

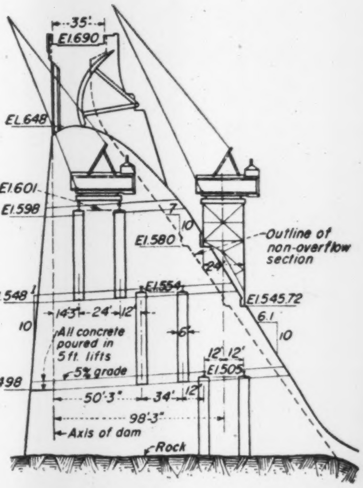
Maximum height of the dam is 240 ft. Its 64-mile long pool will store a maximum of 2,092,000 acre-ft. of water from a mountainous 2,195 sq. mi. drainage area. Of the total storage, 762,000 acre-ft. will be available for flood control, 492,000 acre-ft. for power development, and 838,000 acre-ft. will be dead storage.

Six 4x6-ft. sluices permit further drawdown when desired.

Across a low saddle about half-a-mile from the dam some 400,000 cu.yd. of earth has been used in a 125 ft. high auxiliary dam that has a crest length of 770 ft.

The main dam is four miles from the nearest railhead and some 25 miles from the nearest moderate-sized town. A good access road was built in advance of construction by the Corps of Engineers and is used for hauling equipment and supplies.

Aggregates for the dam are crushed from limestone available at the site with sand made in either a hammer mill or rod mill. Earth fill is hauled from borrow pits nearby. A description of the aggregate plant and



Concrete is placed by revolving cranes, carried at the start of construction on concrete columns.

As concrete nears top cranes are transferred to a gantry with legs of unequal length on the downstream face.

the earthfill work is given in two of the articles following.

Sized material from the aggregate plant moves on fixed belt-conveyor stackers to piles over a reclaim conveyor belt operating in a tunnel under the piles and delivering directly to the mixer plant. Cement is hauled from the railroad and is end-dumped over a bucket elevator that carries it to the bins above the mixer or to storage silos. While a little outdated, the mixer plant, which was built for Fort Peck spillway construction and was used at Pensacola Dam and elsewhere, is giving good service. The four 2 cu. yd. non-tilting mixers are regarded by the contractor as not being the most desirable equipment for this amount of concrete. However, they were available, and award of the contract, when equipment was short in 1942, was predicated on the contractor's having facilities for the project.

On construction prior to the shutdown, concrete was hauled by narrow-gage railroad to point of placing. With work in the second stage cofferdam and on higher blocks above the first stage area going on at one time, concrete had to be delivered to so many places that trucks, used earlier on excavation, were pressed into service. A 2 cu. yd. single-line bottom-dump bucket is set on a truck bed that has space for an additional bucket. Each bucket takes the discharge from one mixer and delivers the one full batch to point of placing.

High columns carry cranes

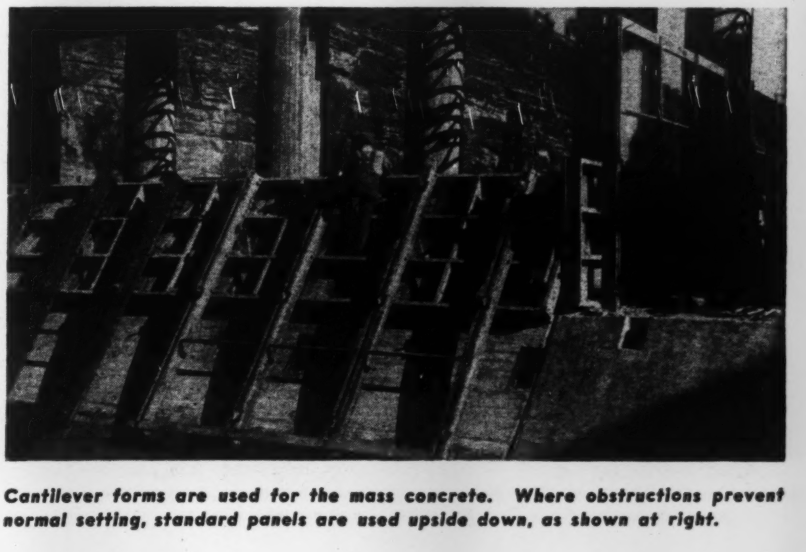
Concrete is placed by oil-fired, steam-powered full-revolving cranes that have a 20-ft. dia track circle and can handle the 2-cu.yd. bucket on a 125 ft. radius. The crane sets an empty bucket on the back of the hauling truck and picks up the full one for transfer to the form. When the truck returns to the mixer it is backed into a "bucket bumper" that slides the empty bucket forward into loading position, since it would not be practicable to carry a full bucket on the back end of the frame.

For placing concrete in the lower part of the dam the cranes are supported on 50-ft. high 6-ft. dia. concrete columns. To resist the eccentric and moving load of the revolving cranes, the high columns are reinforced with 1¼-in. round bars at 5 in. centers in the bottom half and at 10 in. centers in the top half. Dowels at 5 in. centers tie the columns to the rock and to previously placed concrete. The columns are spaced to avoid joints and imbedded steel, and are left in place as part of the dam. I-beams with rails attached directly to them are set on the columns and held to 24-ft. track gage by open steel bracing.

As concrete rises, the columns are extended an additional 50 ft. and the crane is raised to that level. After one or two jumps the rig is moved to a high gantry supported on rails set in recesses on the downstream face of the dam. Gantrys supporting the cranes are as much as 60 ft. high.

Concrete is placed in 5 ft. lifts on a 5 percent slope up from upstream to downstream side and no shear keys are used. Cantilever forms, used for practically all of the concrete, are made of vertical 2 x 6 in. T & G sheathing, with horizontal 3 x 8 studs at top, third-points and bottom. In addition four double 8-in. channel wales are used for each 20-ft. length of form. The channel wales extend to below the line of bolt holes for the lift below where a push-pull connection to the tie for the previous lift takes care of adjustment of the top line of the forms.

No liner is used for the forms, but the downstream face especially is kept in good condition by sanding.



Cantilever forms are used for the mass concrete. Where obstructions prevent normal setting, standard panels are used upside down, as shown at right.

Also, on the downstream face, a roller is used at the bottom of the cantilever arms to prevent the form damaging the face of the spillway as it is raised by a light-weight A-frame and roller-chain hoist.

Concrete in the non-overflow transition to earth embankment was carried on as rapidly as possible to keep the concrete placing operation out of the way of the earthfill. The concrete in that area has now been completed to the roadway level and earth fill is nearly two-thirds finished.

Construction at Center Hill is expected to be completed early in 1948 if congressional appropriations are available early enough to permit the contractor to step up production to maximum plant capacity.

For Massman-Metcalfe-Hamilton, R. G. Stowell is project manager, C. A. Scearcey is general superintendent and R. J. Stowell is chief engineer.

All of the work is under the Nashville District, Corps of Engineers, War Department. Col. H. V. Cahan is district engineer and R. W. McCall is resident engineer.

Aggregate Production at Center Hill

James P. Dealy
Concrete Technician, Center Hill Dam
Corps of Engineers, U. S. Army

Aggregate for concrete for Center Hill Dam is obtained from a limestone quarry located on the left bank of the river about 1,500 ft. downstream from the axis of the dam. The crushing plant, which manufactures both the coarse and fine aggregate, is situated between the quarry and the dam.

Production capacity of the plant is 250 tons per hour of total aggregate, including 80 tons per hour of stone sand. Waste, in the form of lime dust, separated from the screened sand by a 16-ft. dia. centrifugal air separator, varies from only a trace during wet weather to about 1.8 percent of the total aggregate during the dry season. Control of the coarser sand sizes is maintained by varying the screens, adjusting the amount of material introduced into the hammermill, impactor, or roll mill, and by mechanical adjustments.

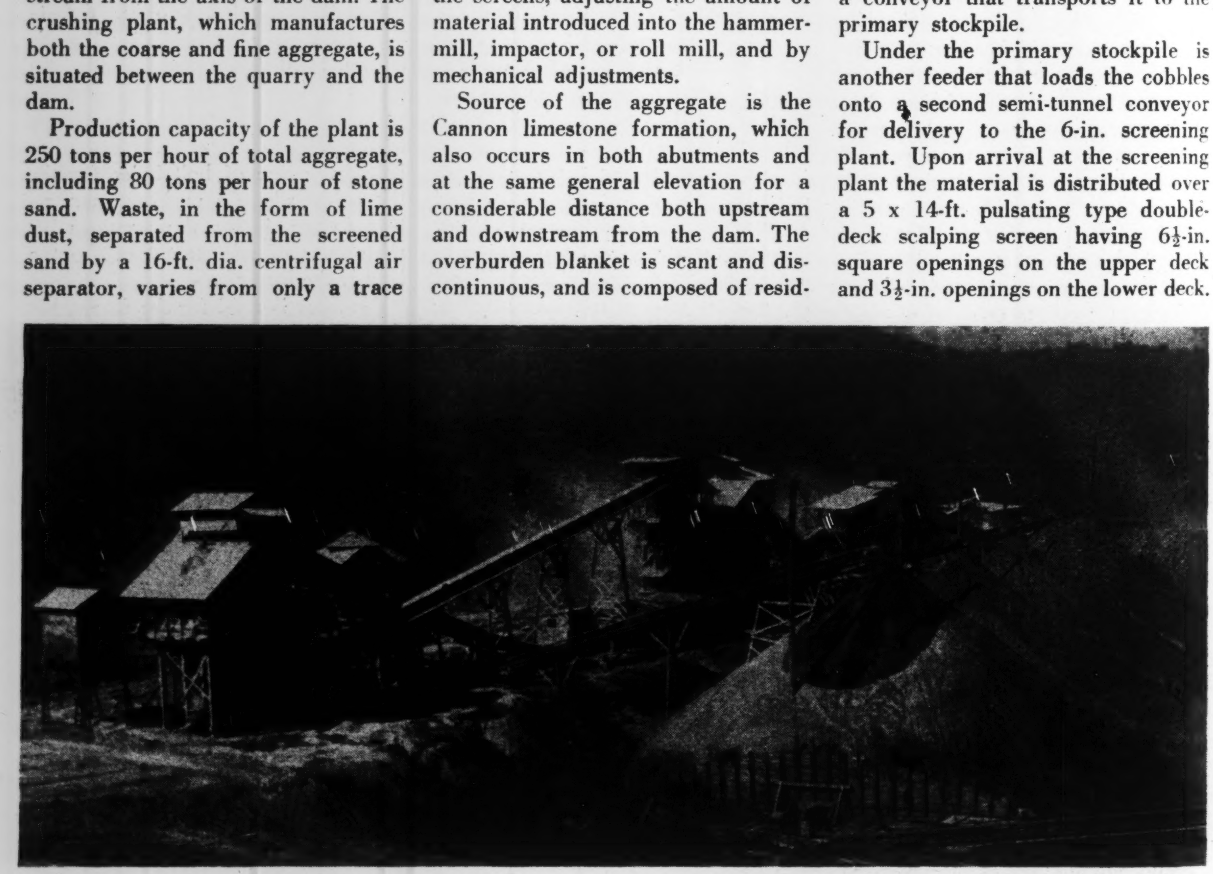
Source of the aggregate is the Cannon limestone formation, which also occurs in both abutments and at the same general elevation for a considerable distance both upstream and downstream from the dam. The overburden blanket is scant and discontinuous, and is composed of residual silt with rock fragments and loose slabs. Underlying this residium is a massive zone of limestone with a few opened joints and locally opened bedding planes.

Face of the quarry is now about 1,000 ft. long and 150 ft. high with its upstream end about 600 ft. from the primary crusher. A section 150-ft. along the quarry face is drilled and blasted at one time. The raw product is loaded by two shovels into self-powered dumper units with capacities of 6 cu. yd. each for delivery to the primary crusher.

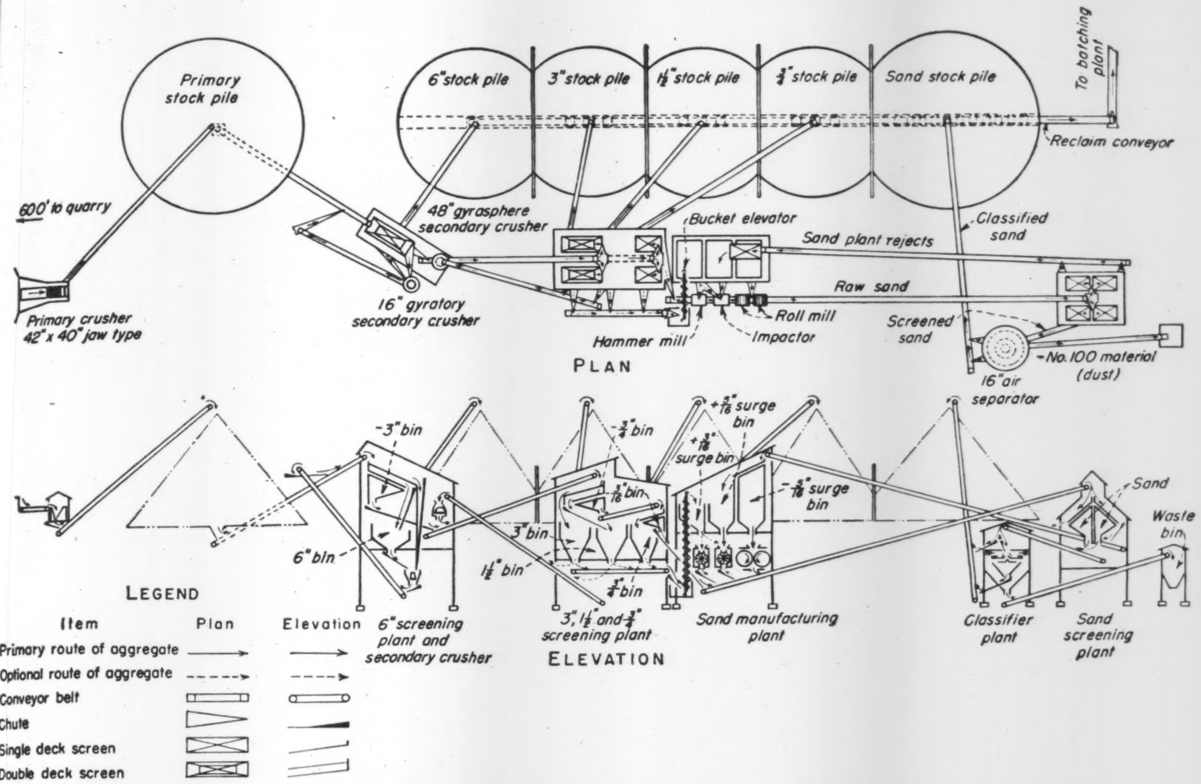
The accompanying flow diagram shows the general layout of the plant, conveyances to and from the various stockpiles and gives the location of the equipment used.

The raw product from the quarry is dumped in a surge bin where a 48 in. x 15-ft. feeder apron introduces it into a 42 x 40-in. jaw-type primary crusher. This adjustable crusher is set to break rock to an 8-in. maximum size. From the crusher, rock is fed to a conveyor that transports it to the primary stockpile.

Under the primary stockpile is another feeder that loads the cobbles onto a second semi-tunnel conveyor for delivery to the 6-in. screening plant. Upon arrival at the screening plant the material is distributed over a 5 x 14-ft. pulsating type double-deck scalping screen having 6½-in. square openings on the upper deck and 3½-in. openings on the lower deck.



Sand and four sizes of stone for concrete are crushed near the dam. Aggregates, reclaimed by belt conveyor under the stock piles, are delivered directly to the mixer plant by the conveyor in the right foreground.


Primary stock pile
600' to quarry
Primary crusher 42" x 40" jaw type
16" gyratory secondary crusher
48" gyrasphere secondary crusher
6" stock pile
3" stock pile
1½" stock pile
¾" stock pile
Sand stock pile
To batching plant
Reclaim conveyor
Bucket elevator
Sand plant rejects
Classified sand
Raw sand
Roll mill
Impactor
Hammer mill
Screened sand
16" air separator
No. 100 material (dust)
PLAN
-3" bin
6" bin
-¾" bin
3/16" bin
3" bin
1½" bin
¾" bin
+5/16" surge bin
+3/16" surge bin
-3/16" surge bin
Sand
Waste bin
6" screening plant and secondary crusher
3", 1½" and ¾" screening plant
ELEVATION
Sand manufacturing plant
Classifier plant
Sand screening plant
LEGEND
Item
Plan
Elevation
Primary route of aggregate
Optional route of aggregate
Conveyor belt
Chute
Single deck screen
Double deck screen

Practically duplicate equipment in the aggregate plant makes it possible to produce almost any proportion of any size material. Aggregates can be returned for further crushing and rescreening from any part of the plant.

Oversizes from the upper deck are fed by a chute to a 16-in. cone-type gyratory crusher with a 3-in. minimum opening, then are conveyed back on the second semi-tunnel conveyor and returned to the 6-in. screening plant for re-screening. The plus $3\frac{1}{2}$-in. stone flows into the 6-in. surge bin and is conveyed to the 6-in. stockpile.

The minus $3\frac{1}{2}$-in. stone from the screen is dropped onto a third conveyor and transported to the 3, $1\frac{1}{2}$, and $\frac{3}{4}$-in. screening plant where it is distributed over two 4 x 12-ft. pulsator double-deck screens with $1\frac{7}{8}$-in openings on the upper deck and $\frac{7}{8}$-in. openings on the lower deck. All aggregate retained on the upper decks flow into the 3-in. surge bin and from there is conveyed to the 3-in. stockpile. Aggregate retained on the lower decks of the screen flow into the $1\frac{1}{2}$-in. surge bin and from there is conveyed to the $1\frac{1}{2}$-inch stockpile.

Under-sizes from the $\frac{7}{8}$-in. screen are conveyed to two 4 x 10 ft. pulsator single-deck screens that separate the $\frac{3}{4}$-in. aggregate and pass it into a $\frac{3}{4}$-in. surge bin where it is conveyed to the $\frac{3}{4}$-in. stockpile. The sizes of the latter two screens are varied with the weather. Screens with $\frac{1}{4}$-in. openings are used in dry weather and $\frac{1}{2}$-in. openings are used in extremely wet weather, and occasionally both sizes are used, depending upon gradation results. Close scrutiny is maintained to assure control of the percentages of over and under sizes and thus assure dense, workable concrete.

Manufacture of sand

Tailings, or undersize material from the coarse aggregate screening plant are conveyed directly to the sand-screening plant where they are divided by a four-way hopper onto four 4 x 10-ft. hummer-type horizontal single-deck screens. These screens are constructed of parallel tie rods with openings of graduated sizes from $\frac{3}{16}$ in. to $\frac{1}{16}$ in. Rejects from these screens are conveyed to a 4 x 10-ft hummer-type horizontal single-deck screen with $\frac{5}{16}$-in. tie rod openings.

Oversize rejects from the second screen flow into the plus $\frac{5}{16}$-in. surge bin, thence to the impactor, for the manufacture of medium-sized sand. The undersized material is screened into the surge bin that supplies material to the roll mill where the fine sand is manufactured. To further increase the production of sand, a simple divider within the 3, $1\frac{1}{2}$, and $\frac{3}{4}$-in. surge bins allows half, or all of this material to be conveyed to a bucket elevator and into an auxiliary surge bin that feeds either the hammermill or the impactor.

All the processed material from the sand screening plant is conveyed through an adjustable dividing hopper, within the classifier plant, that permits all, a part, or none of the screened sand to enter the classifier. The material that does not enter the classifier descends through a chute to a conveyor that transports the material to the stone sand stockpile. Revolving disks and blowers within the classifier separate the dust from the remainder of the sand. Larger particles fall within the center cone, through a chute, and onto the conveyor to the stockpile.

Excess fines collect in the outer cone, fall through a chute, and are conveyed to the waste bin. **Gradation** tests of the waste material showed 99 percent passing the standard 100-mesh screen and 96 percent passing the 200-mesh screen.

Any amount of any size

The flexibility of the plant may be seen by observing the optional routes of the coarse aggregate, as indicated on the flow diagram.

Borrowing of the 3, 1½, and/or ¾-in. aggregate for additional sand production has been discussed above. Similarly, one-half or all of either the 3-in. or 1½-in. aggregate may be conveyed from the respective surge bins to the 48-in. gyratory type reduction cone-crusher located in the 6-in. screening plant. This crusher, with a minimum opening of 1-in., will produce additional 1½-in. or ¾-in. stone from the 3-in. or 1½-in. aggregate. This in turn may be fed to the third conveyor that moves the undersize material from the 6-in. screening plant to the intermediate coarse aggregate screening plant for re-screening. In a like manner, one-half or all of the aggregate in the 6-in. surge bin may be routed, by chute, to the 16-in. gyratory crusher to make additional 3-inch material.

The processed rock is stored in stock piles in five graded sizes over a tunnel with openings on to a 30-in. conveyor. It is fed to the mixing plant as needed for proper proportioning through weight batchers.

Aggregate production—under a sub-contract from Massman-Metcalfe-Hamilton—is being done by Ralph H. Mills and Gorman Bros. Operations at the site are directed by W. E. Edwards.

Earthfill Placing, Center Hill Dam

R. W. McCall
Resident Engineer, Center Hill Dam
Corps of Engineers, U. S. Army

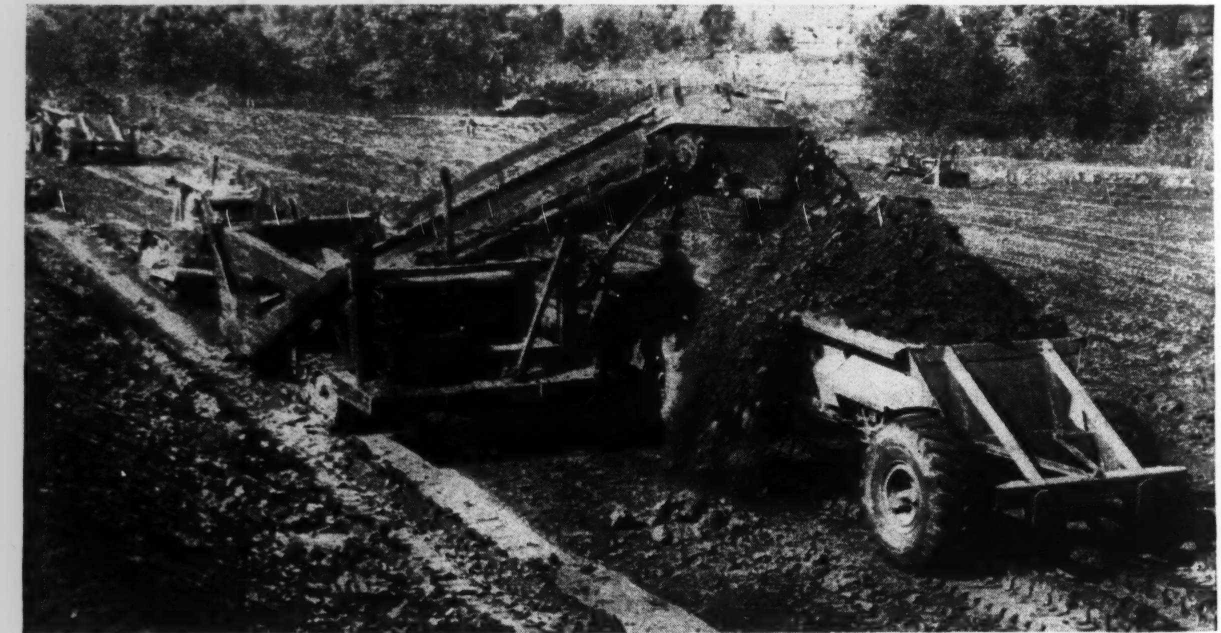
A rolled-earth main embankment section across the left-bank flood plain together with a rolled-earth embankment dam to effect the closure of a low saddle in the reservoir rim on the right bank upstream at Center Hill Dam will, upon completion, involve the placement of 2,500,000 cu. yd. of material.

The main embankment is of conventional cross-section. It has a maximum height of about 180 ft. and a top length of 800 ft. The base length is greater because of the earth cones that surround the concrete section. The basic cross section is impervious rolled-fill with the downstream face protected with sod and berms and the upstream face protected with rock slope and drains. Along the center line of the embankment, a cut-off and inspection trench was excavated to firm rock, then a two-stage grout curtain 75 ft. deep was forced into the underlying rock and the trench was backfilled with impervious material.

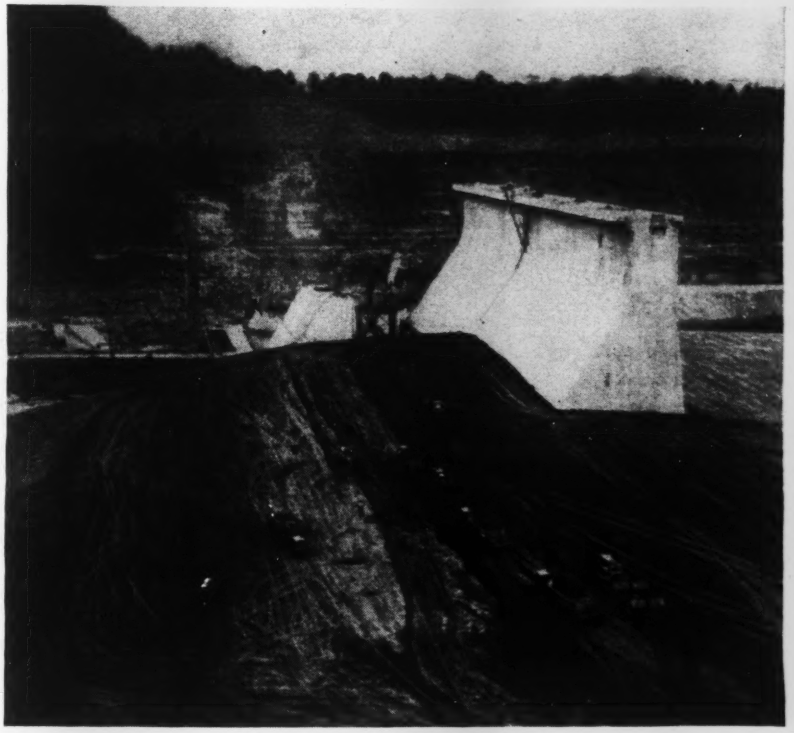
The saddle dam is a triangular embankment of conventional cross section, with a maximum height of about 110 ft. from the bedrock foundation. A grass planted surface with 10-ft. berms leading to dump-rock drains protect the downstream slope of the dam against erosion that might be caused by heavy runoff. A 3-ft. riprap blanket protects the upstream slope against similar erosion.

The predominant available fill materials, in borrowpits upstream from the dam, are high moisture content, impervious, brown clayey silts or silty clays. Only one pit, in the flood plain, has considerable quantities of sandy silt, with traces of clay, and even that material is only relatively pervious.

Length of haul from the borrowpits



Earth moving is expedited by this tractor-drawn loader, which fills 13-cu. yd. wagons in less than a minute.



The fill is carefully compacted around the non-overflow concrete section of the dam. The fill will be completed, to the height of the concrete this year.

varies from 2,000 ft. to over a mile, with the average about 3,500 ft. Equipment assembled for prosecution of this work includes a high capacity plow-type loader, two shovels and a large number of hauling and self-loading machines. Some 8,000 to 10,000 cu.yd. have been moved on "good" 10 hr.-shifts with the equipment shown in the accompaning table. Light plants, air compressors, service trucks, and the like provided auxiliary service.

The loader, which is used largely in the flood-plain pit, is a newly developed unit that cuts the earth with a plow and throws the earth on a 54-in. wide belt conveyor that carries it to a loader chute under which there is a vertical clearance of 10 ft. for the movement of trucks. The unit is equipped with a 150-hp. diesel engine that operates the belt and the hydraulic hoists used to control the position of the cutting point of the grader. A 110-hp. tractor is used to pull the loader. The operator of the tractor also operates the loader.

Use of a tractor-drawn ripper for scarifying the material ahead of the loader greatly decreased the loading time. It has been found advantageous to limit the loader cut to a strip about 4 ft. wide and 15 in. deep. A 'dozer is continually employed in the pit during loading operations for evening the banks and keeping the cut in shape. Under average conditions it is possible to load the 13-cu. yd. haulage units in less than one minute. During one 10-hr. period, the machine loaded an average of 65.2 hauling units each hour.

Mixing and compacting

The specifications under which the work is performed permits the inclusion of some material slightly pervious on the outer shell of the impervious fill, the exact amount depending upon materials and conditions encountered and subject to laboratory approval. When the loader is used in the flood plain pit, which contains coarser material than the other pits, it is deemed advisable to utilize the shovels and scrapers in other borrows simultaneously, and mix the two materials on the fill.

The earth in the fill is dumped in windrows parallel to the axis of the dam and insofar as possible the travel of the trucks and scrapers is kept parallel to this axis to eliminate the possibility of uncompacted ruts being formed.

Each of the haulage units travels alongside a windrow, cuts in at the end of it, and dumps its load at a signal from the spotter. Two bulldozers then spread and mix the dirt in loose 9-in. layers about 10-ft. wide, which are compacted to 6 in. Compaction to a density equal to an established 95 percent of the maximum density of the soil as determined by the Standard Calibrated Oil Method was obtained by three dual-sheepsfoot tractor-drawn rollers having foot pressures of 550 psi.

EQUIPMENT USED TO LOAD AND MOVE 1,000 CU.YD. OF FILL PER HOUR

1	Plow-type loader
20	Bottom-dump trucks 13 cu.yd.
3	End-dump trucks, 10 cu.yd.
	Wheel-tractor drawn carrying scrapers
5	12 cu.yd. capacity
3	15 cu.yd. capacity
5	Large tractors with bulldozers
2	Medium tractors with bulldozers
4	Large tractors
3	Dual-drum 60-in. dia. sheepsfoot rollers
1	Ripper
2	Motor graders
2	Power shovels, 2½ and ¾ cu.yd.

During spreading and rolling, water is added to the material when its moisture content is below that desired. In practically all of the work to date, density tests indicate that field compaction has been 99 percent of laboratory standard. If breakdowns or operational difficulties interfere with continuous earth placing, the tank truck is utilized to prevent excessive drying of the top layer of the soil.

Further to retard objectionable drying, the top layer, left rough by the heavy sheepsfoot rollers, is bladed smooth by a motor grader when the required rolling has been completed at the end of the shift.

The general practice is to work two 10-hr. shifts six days a week during the dry weather season. During the past year from June-November 1946, approximately 1,270,000 cu. yd. of earth fill was placed with the equipment listed. Some 900,000 cu. yd. remains to be completed this season.

Ralph H. Mills and Blythe Bros. are subcontractors on all of the earthwork and on drilling and grouting. Their work is under supervision of J. M. Lipscomb.

Traffic Interchange Plans For Downtown Los Angeles Parkways

***Contents in Brief**—Two major parkways being constructed to relieve congestion in the Los Angeles metropolitan area cross near the heart of the city. A four-level interchange structure will be built to connect these two parkways and plans for access to them call for restricting some of the major downtown streets to one-way traffic.*

THE DESIGN of traffic interchanges for the Harbor Parkway in downtown Los Angeles was worked out to meet two objectives, namely, to minimize interference with existing buildings in a heavily built-up district and to reduce delay to through travel by effective transfer of heavy peak-hour traffic. To achieve these aims, several major streets will be restricted to one-way traffic and, at the intersection of two parkways, an interchange structure having four levels will be built (*ENR* March 23, 1944, vol. p. 425).

The accompanying map shows the Harbor Parkway from its intersection with the Hollywood Parkway at the four-level structure to 9th St., this portion being on the western edge of the main business district of Los Angeles. A substantial percentage of travel on this parkway will be through traffic, but most of it will terminate and originate in these few blocks. To accommodate as much traffic interchange as possible with a minimum of interference with parkway flow, state officials in designing the interchanges have used what they call "collector" roads. These collector roads act as acceleration and deceleration lanes and for four blocks between 2nd and 6th streets, in effect, make a "dual-dual" highway.

Outlets limited

The design follows good parkway practice by limiting the number of outlets and inlets, even in this congested area which will contribute so much of the traffic flow. For example, a car coming south leaves the parkway at 2nd St. to go east on either 4th or 6th streets. Traffic coming out of the main business section and desiring to travel south enters the southbound collector road from either 3rd or 5th St. Thus, although access to the freeway may be had by westbound traffic on 3rd, 5th or 8th St., actual entrance to the freeway occurs at only two points. A similar condition obtains for northbound traffic.

A second feature of this interchange system is that entrance to the freeway is on the right-hand lane only where visibility for the entering driver is a maximum. The left-hand lane thus remains clear so that motorists wishing to travel through the downtown section can, by using one of the left-hand lanes, do so with little or no interference from cars entering or departing from the parkway.

Six one-way streets

To adopt such an interchange system, it was necessary to restrict six of the main downtown cross streets to one-way traffic. Although many other cities have gone to the use of one-way traffic to increase traffic flow, this is the first such instance in Los Angeles. The only streets to be converted to one-way use are those required to provide ingress and egress for the parkway. Downtown streets not connected directly to the freeway such as 1st, 2nd, Wilshire, and 7th will not be restricted to one-way traffic. Such streets will pass over or under the parkway on separation structures.

Another advantage that state officials claim for the system of interchanges adopted is that provision of adequate signs is simplified. Much of the success of traffic interchanges depends on the location and simplicity

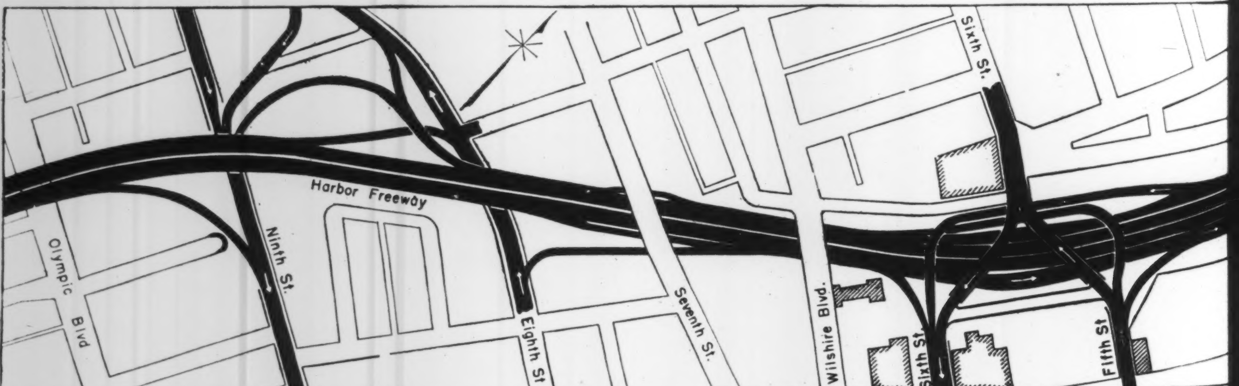


Fig. 1. Key features of the downtown Los Angeles section of the Harbor Parkway are approach ramps that restrict several m

of direction signs. If the driver is given more than one instruction at a time or if the space between signs does not allow him time to assimilate and respond to an instruction, there is danger of confusion.

Four-level structure

To provide traffic interchange at the intersection of the Harbor Freeway and the Hollywood Freeway, a four-level grade separation structure was designed. This structure was conceived some time ago and was described some three years ago, as previously noted. However, actual construction, at first delayed because of the war, is now being held up by lack of housing for the persons to be displaced by clearing the land for the structure. Many tenement type buildings are in the right-of-way and, until new homes can be found for the occupants, the construction work is being deferred.

Traffic movement between two major arteries has usually been accomplished by an "indirect interchange," such as the clover-leaf or some similar plan. Highway designers do not now look on indirect interchanges with as much favor as heretofore. Large areas of land are required for such systems and, in cases like the Hollywood and Harbor parkway intersection, the expense for right-of-way is, according to California highway officials, increased an unreasonable amount. Indirect interchanges are not considered suitable for large volumes because traffic tends to slow down and too much time is required in the interchange.

At the parkway intersection under consideration, property values are relatively high and large volumes of traffic have to be accommodated. Therefore, some sort of direct interchange was desired. After much study and consideration, state officials developed and adopted the four-level structure which satisfies the various requirements and also makes good use of existing terrain features.

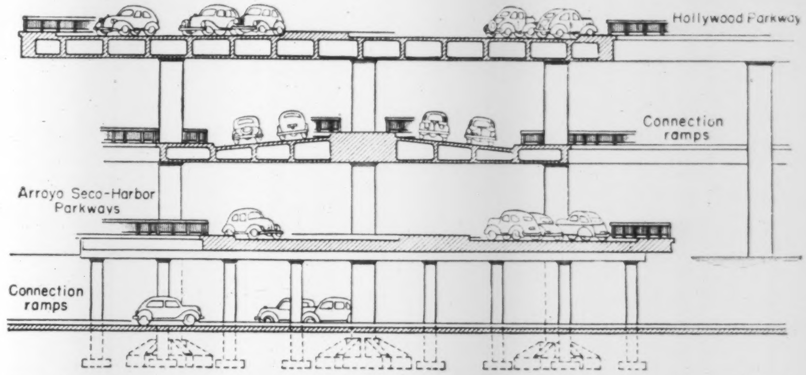


Fig. 2. Section through the four-level interchange between Hollywood Blvd. and the Harbor Freeway, shown at the extreme right in Fig. 1, below. The lower connecting ramps are in a cut below ground level.

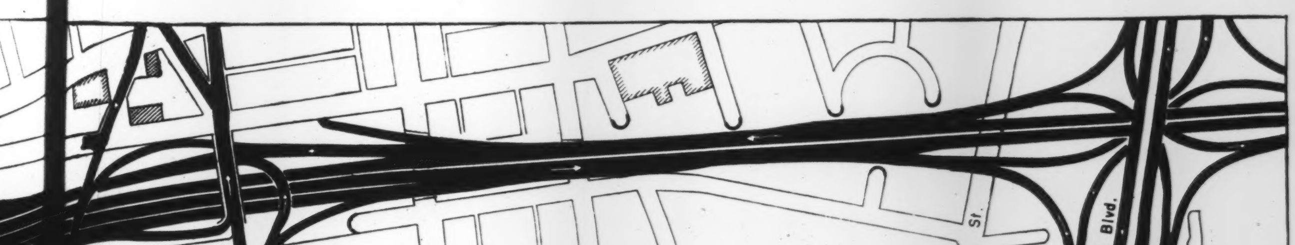
As indicated in Fig. 2, the top level of this structure will accommodate the Hollywood Parkway and the third deck will carry the Arroyo-Seco-Harbor Parkway (the interchange marks the southerly limits of the Arroyo-Seco and the northerly extreme of the Harbor Parkway). The top two levels will be of concrete box girder construction. The third level will be at approximately ground elevation and the fourth or bottom level will require excavation.

Construction of the parkway program in Los Angeles is proceeding in a piece-meal fashion. Wherever area enough is available with no housing interference, contracts have been let. Thus, the date of completion of the facilities described herein is as yet uncertain. Rights-of-way have been purchased and, if the critical housing shortage eases this year, construction may be completed in 1949 of the features herein described.

The California Division of Highways of the Department of Public Works is under the direction of G. T. McCoy, state highway engineer, and work in the Los Angeles area is under the direction of S. V. Cortelyou, district engineer, District VII.

Error in Arch Dam Article

Two errors were made in reproducing George E. Goodall's article concerning the horizontal joint in Lake Loveland Dam (*ENR* Dec. 26, 1946, vol. p. 885). The last sentence of the first paragraph on that page ends with a reference to vertical joint "M". This should be joint "L". Also, in Fig. 2, the letters "M" and "N" on the joints were transposed.



ral m reets to one-way traffic and traffic interchange with the Hollywood Parkway by the employment of a four-level structure.

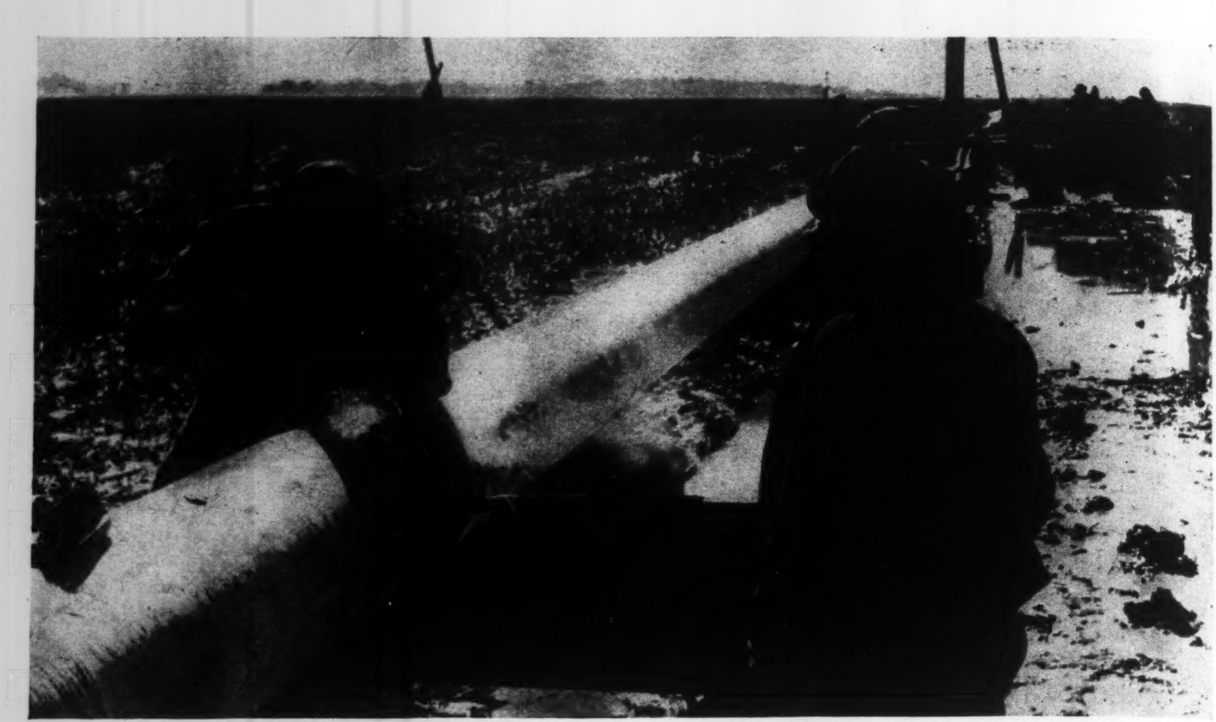


Fig. 1. Pipeline construction in Louisiana marshes required much field welding and special methods of installation.

Pushing a Pipeline Across Marsh-Land

Contents in Brief—*Unusual procedures required to construct a large pipeline across Louisiana marshes include: ditching with special plow and marsh buggies; pushing welded sections of pipe, up to three miles in length, into place with a pontoon-mounted power winch; and field-welded joints that withstood test pressures of 1,050 psi. without leaking.*

Pipeline construction in the oil fileds ordinarily follows a universally adopted and highly mechanized routine of ditching, welding, installation and backfilling. But such standard procedures were not applicable to the construction of 22 miles of 14-in. pipeline, completed last year by the Production Department of the Humble Oil and Refining Co. across Louisiana marsh lands.

Chief obstacle to be overcome was the sticky, gray mud, typical of Louisiana marshes, that made walking slow and treacherous and offered inadequate support for conventional pipe-laying equipment. Consequently, the all-welded seamless pipe was literally pushed across the 22 miles of marsh, in eight stages.

The pipeline will deliver 60 million cubic feet of dry gas per day from a new separation-dehydration plant at Pecan Island to a connection with a cross-country transmission line of the Interstate Pipe Line Co. at a point about seven miles southwest of Opelousas, La.

The entire project called for the construction of 65 miles of line, some two-thirds of which traversed farming country and consequently could be laid in conventional manner. Total contract cost was $1,509,000.

First operation in constructing the 22-mile marsh section of line was to make a location survey, first by plane then on foot and with four-wheeled motorized marsh buggies equipped with 6-ft. steel treads and designed especially to traverse the unstable marsh land, which ordinarily is covered with 6 to 12 in. of floating turf. An instrument man atop high towers erected along the proposed line, flagged the survey party on line at all times. The final line was staked out with red bunting nailed to long stakes driven at fairly close intervals.

The route selected roughly parallels existing canals and bayous which permitted all pipe and construction equipment being delivered to the job first by truck and then by barge. The line also crosses beneath both the old and the new Intracoastal canals, which required the installation of special bent sections of pipe.

Maximum push of three miles

Previous experience had proved that the maximum length of line that could be installed by the "pushing" method was in the neighborhood of three miles. Consequently, high points, from 4 to 10 ft. above the surrounding marsh, were located on the canal banks at intervals not exceeding six miles. From these points the pipe could be pushed in both directions to make possible the meeting of two connecting sections.

The terminology, "pushing the pipeline into place," stems from the method of its installation. A pontoon-mounted winch located at each high point, astraddle of the previously excavated pipeline ditch, hooked onto the rear end of the first 200-ft. length of welded pipe and pulled it forward until the rear end of the section approached the winch.

Then, the next 200-ft. length of pipe was welded to the previously installed pipe and pulled forward a distance of about 200 ft. This procedure was continued and while the winch pulled each added section into place, all previously installed pipe was pushed ahead of it out into the marsh. Needless to say, each length of installed pipe between any two high points adjacent to the canal was on a tangent. Maximum length of push on the job was 16,000 ft.—a seemingly incredible operation.

Ditch dug with special plow

Excavating the ditch in which the pipe was laid posed no unusual problems in this type of work, although it did require special equipment. The ditch was excavated about 2 ft. wide and 2 ft. deep, to give a 6-in. minimum covering over the pipe. Excavation was by two 4-wheel marsh buggies pulling a specially designed V-type plow at about 5 m.p.h.

The 14-in. pipeline, which was required to withstand a working pressure of 1,000 psi., was seamless tubing weighing 59 lb. per lin. ft. and having a wall thickness of 0.406 in. All field connections were electric arc welded and the entire length of pipe was coated with a $\frac{1}{2}$-in. thick composition of heavy asphalt, asbestos, cement and sand. The weight of the pipe, plus this mastic coating was sufficient to keep it submerged on the bottom of the water-filled ditch.

No water was permitted to enter the pipe while it was being installed. However, it was prevented from gouging into the muddy bottom of the ditch by welding a huge "bull plug" to the forward end of the first section of line for each length of tangent. The bull plug was a 20-ft. length of light-weight 16-in. pipe, with its front end plug welded so that the entrapped air made it buoyant.

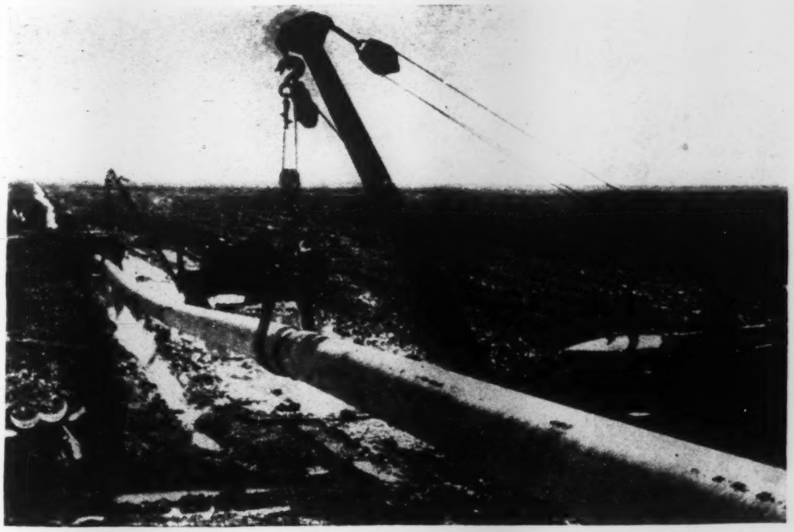


Fig. 2. Operating on timber plank runways, side-boom tractors guided the pipe and aided the power winch in pushing the pipe out across the marshland.

Fig. 3. Power for pushing the pipeline was furnished by a gasoline engine and winch supported above the marsh on steel pontoons.

During pushing operations a workman walked beside the line to keep this bull plug from jumping out of the ditch and wandering off through the marsh.

The pipe arrived on the job in 40- or 50-ft. lengths fully coated with the mastic covering except for the last 9 in. at each end. They were assembled in 200-ft. sections in pipe racks near the pushing winch, joints were welded, cleaned and coated with the asphalt mastic. Coating of the joints was done by pouring the heated mastic into a special steel clamp fastened around the pipe and left in place until the material had cooled.

Two side-boom crawler type tractors then swung the 200-ft. section into position where its forward end was welded to the rear end of the previously installed pipe. All field welds were standard pipeline, 60-deg. beveled welds.

The winch that pushed the pipe-

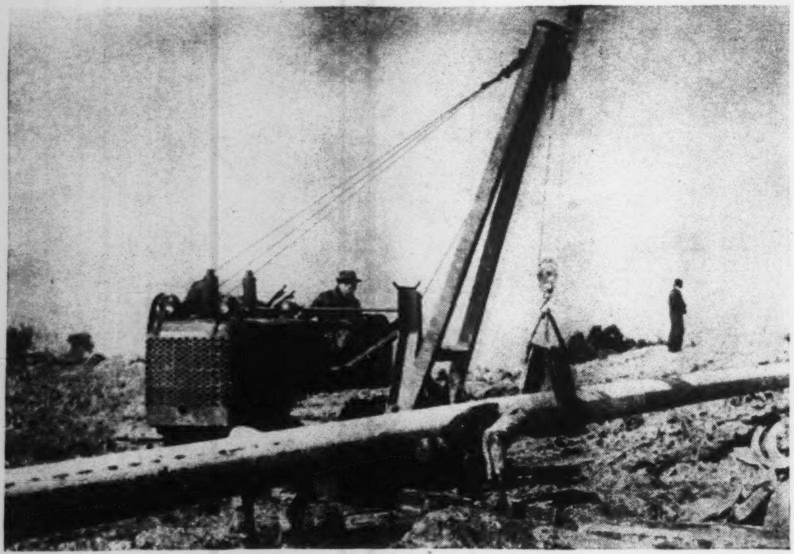


Fig. 4. Special lifting slings of belting were used to lift the heavy sections of pipe to avoid damage to the protective mastic coating.

line was mounted on a wooden platform fastened atop two 24-in. dia. by 12-ft. long steel pontoons anchored securely in place by two steel "spuds" driven deep into the marshy soil.

The winch was powered by an 85-hp., V-8 gasoline engine and operated a $\frac{5}{8}$-in. wire cable extending back to the rear end of the last section of pipe added to the line. The cable was fastened to a special non-slip collar attached to the end of the pipe.

The two tractors that were used to swing the 200-ft. welded lengths of pipe into position, also aided materially in pushing the entire line forward. To do this, however, it was necessary to build a 20-ft. wide by 200-ft. long board runway extending behind the winch and adjacent to the pipeline, and built strong enough to support the tractors. As each push was started the tractors hooked onto the pipe and helped walk it forward.

When work was stopped at night the rear end of the pipe was plugged to keep muskrats from entering. Before starting a push in the morning, the winch was reversed and the previously laid line was retracted several feet to break the bond between the pipe and the sticky mud forming the bottom of the ditch.

No leaks at welded joints

Not the least incredible part of the entire installation was that no leaks appeared at any of the field welds throughout the entire 22 miles of marsh section of pipe. First operation in-testing the line was to purge it of air to eliminate the danger of explosions, by forcing gas through it under a pressure of 100 psi. Then the line was blown clean with gas under a pressure of 400 to 600 psi. to remove any welding burrs, swabs or other foreign objects that might inadvertently have been left in the line.

Final operation was to test the line under a pressure of 1,050 psi. During this last phase of the test the entire line was patrolled by line walkers who kept in constant communication with field testing headquarters by means of two-way radios.

The entire 65-miles of pipeline construction was performed under a contract held by the Associated Contractors and Engineers, of Houston, Tex. For the Humble Oil and Refining Company, the work was in charge of S. W. Oberg, chief of the civil engineering department; H. N. Stamper, construction engineer; R. A. Rait, field engineer, and E. G. Rech, chief inspector.

Land Serviced with Utilities Available for Housing

Completing the first statewide survey to plot available middle-priced housing sites, Massachusetts reports it has 35 times as much land as necessary to satisfy 1947 construction schedules within city limits and with water facilities available.

The Association of State Planning and Development Agencies reports that the site study was started to determine best location for housing to be built under the veterans emergency housing program. Though this program has been curtailed, the association observes that the Massachusetts study is significant because of the need for finding new housing sites accessible to utility connections.

Planners divided available Massachusetts land into classifications of "suitable" and "most suitable" for residential development in tracts of five acres or more. Of 190 communities surveyed for available land, 109 were zoned. In zoned communities alone, present regulations permit a total of 1,581,600 new dwelling units on the land most suitable now for development.

The Massachusetts fraction of the veterans emergency housing program called for about 45,000 new dwelling units to be constructed during 1947 in the 190 communities surveyed. These 45,000 units would occupy some 15,000 gross acres of open land. The Massachusetts survey discloses within corporate limits of 109 zoned communities there are at least 507,900 acres of land suitable for development.

The 190 communities surveyed include 86.3 per cent of Massachusetts' population. Of the land "most suitable" for housing development, at least 83 percent is available for single family homes under current zoning ordinances. Seventy-one percent of the most suitable acreage is available for two-family dwellings, and 57 per cent for multi-family dwellings.

Eighty-one of the 190 communities surveyed were found to have no zoning ordinances, while 62 have no planning boards. The state planning board has recommended that local planning units be established in all cities and towns and that adequate zoning regulations be adopted to facilitate methodical development.

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Civil Engineer Enrollment

Sir: In your issue of March 13th you show, on vol. p. 418, the ratio of civil engineering to total engineering enrollment in Canadian colleges. For this college you have the total enrollment at 1,154 with 58 civil engineers in the 3rd and 4th years. These figures are correct and presumably were obtained from the list compiled by the Engineering Institute of Canada.

However, as is the case in most Canadian universities, the first two years are the same for most branches and in this particular case, the 58 comprise the total of civil engineers for the third and fourth years *only*. We do not have the figures on probable civil engineers in the first and second years. The only fair comparison, therefore, would be to find the ratio of the number of civil engineers in the third and fourth years to the total enrolled in those years, i.e. $\frac{58}{274} = 21.2$ percent. Please note that you show the ratio as 5 percent. Apparently you have shown similar figures for other Canadian colleges.

R. A. SPENCER
Dean of Engineering
University of Saskatchewan
Saskatoon, Sask.

Bidding for Engineering Services

Sir: In the Jan. 9 number, vol. p. 33, you print an editorial entitled "Bidding for Engineering Services". By implication, if not by direct assertion, you seem to indicate your approval of a practice which is unequivocally condemned by a majority of ethical engineers.

The arguments used to support your position seem to me to be specious. You write of "an unhealthy situation", of a disparity between theory and practice, of competition of a "very low order", and conniving through political influence, and of the use of "devious channels" to obtain an advantage. These are serious charges. It would be futile to deny that there are some unethical engineers, as there are charlatans in the legal profession and quacks in the medical profession. But these men do not set the tone of their respective professions. They are frowned upon, their reputation is malodorous and they are disciplined whenever valid evidence can be secured. In this work of disinfection, the engineering registration boards of the several states have played and are playing a conspicuous part.

You state that the establishment of standard minimum fees for engineering services gives the engineer with a recognized standing a distinct advantage over the relatively unknown but "possibly equally able engineer". Well, why not? Isn't an established goodwill acquired by long years of meritorious service and accomplishment, recognized everywhere as a well-deserved business asset?

If I read you correctly, you would remedy what you conceive to be a deplorable situation by letting down the bars and inaugurating an uncontrolled era of price-cutting and other "devious" tactics. The proposed cure is worse than the disease. We do not repeal the laws against burglary and forgery because a few malefactors out of our total population continue to commit these crimes. The remedy in the case of engineers lies in greater vigilance, higher ethical standards and a continuing process of education.

In our organization we urge our members to refuse to submit competitive bids for their services. It is true as you state "that every engineer, doctor and lawyer in private practice does put a dollar value on his services"; but it is not true that he varies his set fees in order to take business away from a competitor. In engineering, as in other professions, the lowering of fees is a standing invitation to cut corners and lower the quality of the service to be rendered.

When a municipality wishes to engage engineering service, its proper procedure is to select the engineer on the basis of merit and reputation only. There are always plenty of competent men and firms who will enter into competition on that basis. Let the city examine the work of each competitor elsewhere, investigate his record, interview his former clients. This should give a basis for judgment and selection. The fees can then be agreed upon through negotiation; but they should not fall below a standard minimum.

In pursuance of this objective, the Minnesota Association of Professional Engineers, in accordance with the policies of its national body, the National Society of Professional Engineers, has prepared and promulgated a schedule of minimum fees and salaries. It will be noted that the word "minimum" indicates a floor but not a ceiling. This schedule was first published in 1941; it is now being revised to meet the conditions of today.

It is true in Minnesota as in most other states that the law prescribes competitive bids for municipal public works and for standard municipal supplies when the cost exceeds a certain minimum figure. But we have an opinion from the attorney-general that this restriction does not apply to professional services. Our engineers compete with plans and designs for the proposed project; the fees are determined by negotiation, with a set minimum as the floor. When a municipality requests our office to recommend a candidate for, say, a vacant position as city engineer, we make it a policy not to recommend a man unless the city agrees to pay at least the minimum salary prescribed by our schedule for a position carrying the responsibilities and requiring the experience and ability of the one in question. We are gradually educating the public in general and the governmental authorities in particular to acceptance of the fact that engineering ability of a high order cannot be purchased cheaply. We are also driving home the principle that cheap engineering service is dear at any price. In this equation, public health, safety and property are important factors and are therefore not negligible in the public interest. Moreover, professional dignity and integrity are involved; without these attributes the profession inevitably loses in public respect and esteem.

You will gather from the considerations set forth above that the Minnesota Association of Professional Engineers is firmly opposed to the proposals put forward in this editorial and finds the supporting arguments somewhat less than convincing. For an indication of the attitude of reputable engineers, please note the letter in the same issue of your magazine, vol. p. 65, from Arthur W. Consoer.

Richard R. Price
Executive Secretary,
Minnesota Association of Professional Engineers, St. Paul, Minn.

Cascade Highway Tunnel

Sir: Your digest of the major phases of Mr. Singstad's report on a Cascade Mountain highway tunnel in Washington is excellent (*ENR*, Feb. 20, vol. p 255). So is the report itself in its appraisal of the various possible tunnel routes and sites and in its selection of what is unquestionably the best and most logical one.

This report appears to have put a quietus on the nonsensical clamor for a 32-mile or what-have-you tunnel at about the 1,000-ft. above sea-level contour. If it continues to do so it will be well worth its cost. However, in advocating that the state proceed to build this 2.03-mile two-lane tunnel at a cost of $21,940,000 with revenue bonds which presumably somebody is going to buy, in presenting it as an important, almost necessary, construction for the state's well-being, the report still leaves room for differences of opinion.

Briefly, the proposal is to relocate and rebuild that 8.97 mile section of the state's main east-west road at the summit of the Cascade Mountains in the zone of very heavy snowfall, reducing the summit elevation from 3,004 to 2.636 ft., eliminating 2.57 miles of distance, eliminating the possibility of snow slides, eliminating snow or ice on the pavement for 2.03 miles of tunnel and substituting 3.00 percent grades for the existing ones which range from 5.00 to 5.90 maximum for 5.50 miles of the present distance, and are 2.50 percent or less for practically all the remainder distance.

These are all attractive improvements yet attractive likewise is $21,940,000, a not inconsiderable sum of money even in these days. If substantially the same results could be achieved at less expense it is evident that some or most of these millions would not have to be spent. For example, 3,000 ft. of snowshed would as completely eliminate slides as the tunnel would, since only at two places have slides ever occurred. A simple relocation of road would eliminate practically all of the 5 percent grade on the east side of the summit, and if it were vital, relocation could eliminate grades over 5 percent on the west side. There has never been any trouble in keeping the road open with plows and rotaries in the past and the only blockades have been caused by slides. As for packed snow and ice on the surface of the road, that will continue to be whether a tunnel is built or not. Lots of winters there is snow on roads from 30 miles east of Seattle clear back to the state of Maine.

Ah, but the tunnel and the relocation would have 3 percent grades instead of "very steep" 5 percent grades! That is true, but the whole highway system of the state of Washington has been constructed with grades as heavy as those over Snoqualmie Pass. For example, the traffic of the new Columbia Basin irrigation district, which the tunnel is supposed to bring to Puget Sound, must ascend 9.20 miles of 5-percent grades (5.44 max.) after crossing the Columbia River at Vantage Ferry with snow on the road in the winter time. Moreover the nation's proposed 34,000-mile system of superhighways is to be built to the following specification:

> "Gradients . . . The maximum gradients preferably shall not exceed 5 percent and in any case shall not exceed 6 percent. On short lengths only, gradients of 7 percent may be used."

In avoiding the strongly emphasized dangers of slides to which surface traffic—without snowsheds—is exposed, Mr. Singstad gives no discussion of the hazards to safety which a 2-mile tunnel with one line of traffic each way presents. He makes provision for failure of the power supply lines, but there still is the possibility of a mechanical failure of the ventilating system or a mechanical failure of a car or truck in the middle of the tunnel or a head-on collision. These all would present certain hazards to safety and free flow of traffic that should not be ignored.

Nor should the adverse effect upon revenues be ignored that will arise when cars necessarily provided with chains for approaching and leaving the tunnel have to run on bare pavement for 2.03 miles. If they have to repeat the trip many times they may find it less expensive to stay on the snowy road on top where no toll is charged. And it may be that a considerable number of the 54 percent of the passenger cars crossing the pass will not elect to pay a 50-cent toll to ride through the tunnel as Mr. Singstad so hopefully and seemingly arbitrarily estimates.

These are all factors to be considered in estimating the value of the tunnel and of its revenue bonds.

Homer M. Hadley
Consulting Engineer, Seattle, Wash.

Civil Engineering Students

Sir: Your statistical article "Ratio of Civil to Total Engineering Enrollments" might be appropriately titled "The Low Engineering School on the Totem Pole", in which event the Low-Man-Merit-Medal goes to the world famous MIT of Boston.

Suspecting that your tabulation might indicate the "drift" of future engineering "brains" from the Land of the Sacred Cod to the Land of Sunkist Oranges & Gorgeous Glow of the Golden Gate, was I surprised to find that the Thayer School in Hanover, N. H. wins the door prize with an enrollment of 40.9% of "civvies". But inasmuch as the total enrollment in Hanover is a mere 110, perhaps the true "drift" of brains might be better indicated by weighting the "civil" enrollment on the basis of population for education areas.

Not that it matters which city or state is now incubating the engineering progeny for the headaches of tomorrow, but inasmuch as the future of civilization has been prognosticated for the west coast, we on the east coast anxiously watch each rising tide of the old Atlantic as it nibbles the coast line back, back, back toward the Rocky Mountains.

Can you allay our fears?

Thomas N. Ashton
Boston, Mass.

(Editors Note. We are both neutral and confused.)

Construction Costs

1947

Each year Engineering News-Record compiles current data for measuring trends in construction and building costs, materials prices and labor rates. This 1947 edition highlights the important changes reflected by the transition from a war to a peacetime economy. Of special interest are the cost indexes, which provide the means for making comparative studies on the basis of past experience, and new data on housing cost evaluation.

TABLE OF CONTENTS

Construction Labor Productivity.................................. 92
Costs Cut on Public Housing Project.......................... 94
How to Get Lower Cost Bridges................................ 98
Industrial Plant Cost Reaching Peak.......................... 101
Cost Comparisons Aid Selection of Building Materials.......... 102
Highlights of Construction Costs—1947......................... 107
ENR Construction and Building Cost Index.......108, Insert, 109, 111
Construction and Building Cost Indexes.....................108-119
ENR Construction Volume Index............................. 111
Federal Man-Hours of Labor Estimates....................... 113
Prices of Construction Materials...........................121-129
Construction Wage Rates...................................131-140
Road Building Costs.. 142
Depreciation Schedule—U. S. Bureau of Internal Revenue......145-147
Base Rates on Compensation Insurance........................ 149
Index of Construction Machinery Prices..................... 150
Construction Equipment Rental Rates......................... 153
Cost of Financing.. 155
Index of Small House Cost.................................157-159
Unit Prices, Index... 161

AN ENGINEERING NEWS-RECORD ANNUAL FEATURE

Construction Labor Productivity Gains

A SECOND TEST SURVEY of construction labor productivity conducted by *Engineering News-Record* this spring, one year after the first (*ENR* April 18, 1946, vol. p. 557) shows only a slight improvement in skilled building labor but a 10 percent overall improvement in productivity of common building labor. Median productivity, computed on the same basis by 26 building contractors in 12 cities, is 66 percent of 1939 for 1947 compared with 65 percent a year ago. The common labor median on building construction climbed in the same period from 68 percent of 1939 productivity to 75 percent.

On heavy engineering construction, both skilled and common labor productivity show good gains, 33 percent for skilled and 25 percent for common, over 1946 reports. Skilled productivity in 1947 is reported for carpenters and equipment operators by 10 contractors in 8 cities at 80 and 83 percent of 1939 and common labor at 75 percent compared with 64 percent for both in the 1946 study. The range for skilled productivity on heavy construction is 47-100 percent of 1939 and for common labor from 52-104 percent of 1939.

Reasons for continued low productivity continued to be much the same as a year ago with some shift in emphasis. "Lack of interest" on the part of workers moved into first place on both building and heavy engineering construction. "Average age high" took second place on building, "labor shortage" third and "materials shortage" fourth. On heavy engineering construction, "labor shortage" was second and "material shortage" was the third most frequently ascribed reason.

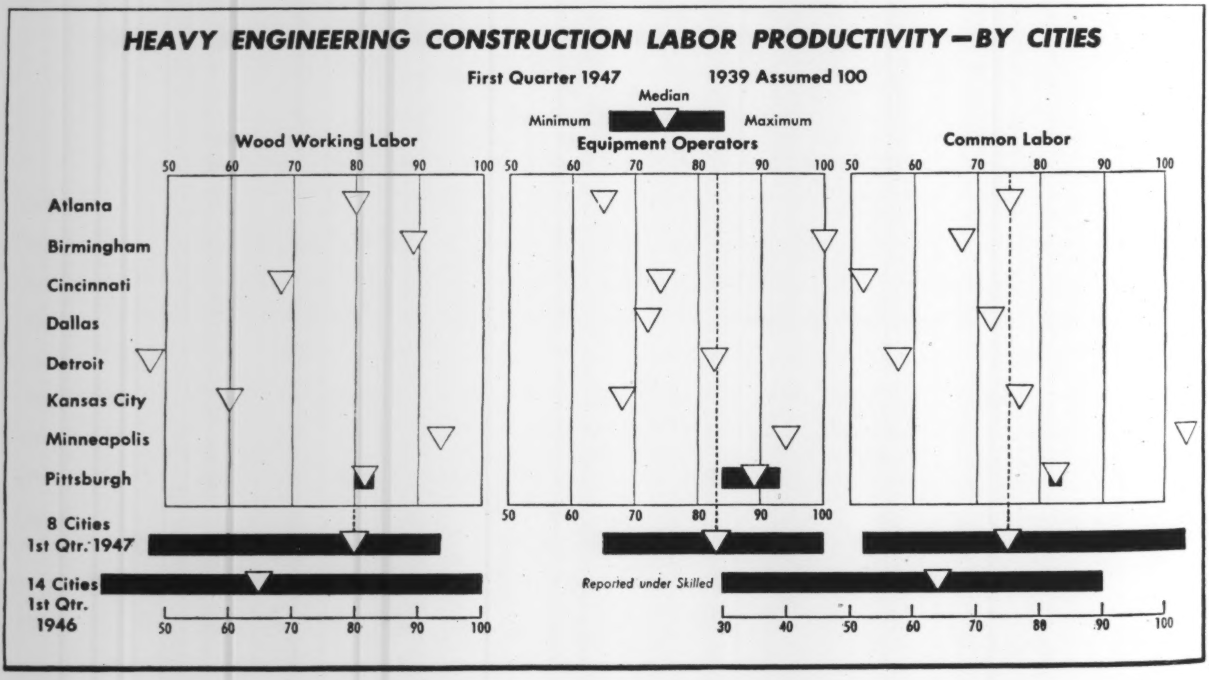
Some of these causes, notably "materials shortages", "workers new to construction" and "workers new to contractor's organization" are in the process of curing themselves.

Conditions Affecting Productivity	Percent of Companies Reporting 1947 Bldg.	Engr.	Both	1946
Lack of worker interest......	74	82	77	56
Labor shortage..............	61	73	65	66
Shortage of materials........	57	64	59	9
Average age higher..........	65	36	56	16
Featherbedding.............	48	36	44	31
Higher scale crafts used......	43	36	41	3
Workers new to construction..	35	36	35	34
Workers new to contractors...	30	36	32	19
Jurisdictional..............	35	27	32	3
Union Work quotas..........	22	18	21	25
Overmanning (war holdover).	22	18	21	6
Absenteeism................	....	27	9	6

Additional 1947 reasons, 1 report on each "Efforts to hold men due to labor shortage," "Bonus, travel expenses, etc.", "Skilled mechanics mainly apprentices or old men," "Lack of skilled replacement with proper cub training," "Workers less skillful."

The formula used for computing current productivity based on 1939 = 100, as shown in the accompanying box, was suggested by a St. Louis contractor to take this important factor in construction cost estimating out of the realm of opinion and into the actual records of the job. It divides the theoretical cost (based on wage increases alone) by the actual labor cost on the job as determined by cost records. By using a work unit costing $1 in 1939, the result is present productivity compared with 1939 productivity as 100.

The higher productivity on heavy construction holds for most of the individual cities. In Birmingham, for example, skilled productivity a year ago was reported at 50-60 percent of 1939, this year it is up to 88-100 percent, of 1939. Common labor a year ago was 50-60 percent, this year 67 percent. Dallas last year 50-60, this year 71 for skilled, the same for common. Detroit, last year 80-93 for skilled, this year 47-82, for common 30-90, median 60, this year 57. In Pittsburgh last year skilled produc-


HEAVY ENGINEERING CONSTRUCTION LABOR PRODUCTIVITY—BY CITIES

tivity was reported at 80, this year 80-93, median 83, common a year ago 75, this year 82-83 percent of 1939. The overall range reported a year ago for skilled labor productivity was 40-100 compared with 47-100 this year, and for common labor on heavy engineering construction, 30-90 a year ago compared to 52-104 this year.

For measuring productivity on building construction, "skilled" labor is an average of carpenters, bricklayers and structural steel or iron workers. The wage rates on which this study is based ranged from $1.00-$1.50 for carpenters in 1939 (average $1.336) to $1.50-$2.20 in 1947 (average $1.842). For bricklayers the 1939 range and average are $1.25-$1.75 and $1.54, in 1947 $1.825-$2.625 and $2.095 and for structural steel workers, $.90-$2.00 and $1.53 average in 1939, $1.688-$2.25 and $1.98 in 1947. Common building wages ranged from $0.30-$0.92 and averaged $0.782 in 1939, and from $0.85 to $1.50 range and $1.222 average in 1947.

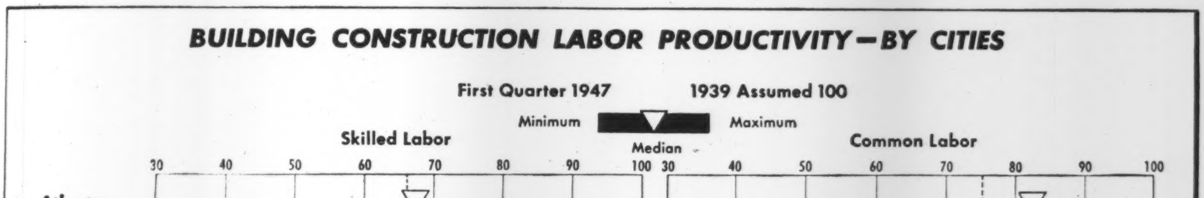
By cities, 1947 building productivity trend compared with 1946, is mixed. In Cincinnati, skilled and common productivity are each higher, 71-82 for skilled compared with 64-75 a year ago, and 74 for common compared with 60-70 last year. At Detroit skilled labor productivity is reported at 53-75 percent of 1939 compared with 50-75 percent last year, but the median is 63 compared with 60 a year ago. Common labor in Detroit at 60-90 percent of the 1939 productivity compared with 50-85 percent a year ago. The 1947 Detroit median is 78 percent compared with 60 percent in 1946. At Kansas City the skilled productivity range reported is 62-71, median 66 compared with the 1946 range of 40-85, median 70. Common labor in 1947 at 72-92 percent of the 1939 rate, 76 percent median, compared with 60-85 percent in 1946, 60 percent median. At Minneapolis the range is down but the median up for skilled labor, 54-71 percent in 1947, median 66, compared with 60-80 percent in 1946, median 60. Minneapolis common labor productivity is up, 75-80 percent in 1947, compared with 60-75 in 1946. From New York, skilled productivity is reported at 62-67 percent in 1947 compared with 60-68 percent in 1946 and common labor 62-74 percent this year compared with 50-60 a year ago.

FORMULA FOR COMPUTING CHANGES IN LABOR PRODUCTIVITY

Craft	Wage 1939	Scale 1947	
Carpenter	1.336	1.842	
Bricklayer	1.540	2.095	
Iron Workers	1.530	1.980	
Skilled average	1.469	1.972	+34%
Theoretical cost, 1 work unit	$1.00	$1.34	
Actual cost, 1 work unit	$1.00	$2.03	

$$\text{1947 Productivity} = \frac{\text{Theoretical Cost}}{\text{Actual Cost}} = 66\%$$

In Pittsburgh the skilled range, 65-81 percent in 1947, compares with 54-65 in 1946 and the common labor productivity, 69-96 percent in 1947 compares with 70-90 percent of 1939 in 1946. In St. Louis the skilled productivity range is higher than a year ago, 59-81 percent compared with 50-74, but the 1947 median, 64 is lower than the 1946 median, 70. On common labor in St. Louis both the range and the median are higher, 66-91 percent of 1939 in 1947 compared with 65-72 percent in 1946 and the 1947 median of 80 percent compares with 70 percent in 1946.



*Comparable cities missing 1947

Cavity Walls and Slab Bands Cut Costs For Multi-story Public Housing Project

Contents in Brief—*Design features of the low-rent Elliott project of the New York City Housing Authority include the use of a reinforced concrete slab-band floor system, cavity-type exterior walls of brick and cinder concrete block, scissor-type stairways and a two-legged concrete rigid-frame support for a cylindrical wood water tank. Concrete for the two 11-story and two 12-story buildings was placed directly from bottom-dump buckets through the use of a crane with a long boom and a gooseneck jib.*

Now nearing completion in downtown Manhattan, the four multi-story building of the low-rent John Lovejoy Elliott Houses incorporate many expedients to minimize the cost of construction without sacrificing quality. Through the use of standardized details, cavity-type exterior walls, a slab-band floor system and other economy features, the New York City Housing Authority, for whom this $5,000,000 development is being built, is keeping the construction cost per room of the superstructure to about $1,215.

First of the authority's post war projects, the Elliott houses encountered difficulties in getting under way. Three attempts at obtaining satisfactory bids were made before the contracts for construction were finally awarded. In Oct., 1945, prospective bidders refused tenders in protest against a "no-labor-trouble" clause in the contract (*ENR* Nov. 1, 1945, vol. p. 536) and in Nov., 1945, following settlement of this issue, all bids were rejected because the lowest was about 68 percent above 1940 costs (*ENR* Nov. 29, 1945, vol. p. 704).

However, in the belief—which later events justified—that prices would continue to rise and that it would thus be more economical to erect the buildings before prices moved much higher, the authority awarded a $208,300 contract for the foundations in December, 1945, and a $2,747,345 contract for the superstructure in April, 1946.

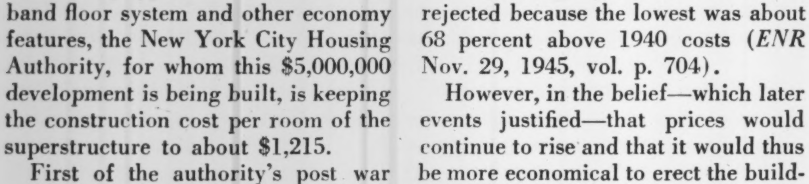


Fig. 1. *Spanning a central row of columns in each wing of the four buildings of the low-rent Elliott housing project, the concrete slab band terminates in a T-shape near the end of the wing.*

The Elliott houses are being erected between West 25th and West 27th streets and between 9th and 10th avenues in Manhattan, in a neighborhood in which multiple-dwelling tenements occupy the full width of their lots. In contrast, the relatively large distances between the new buildings and their irregular shapes in plan allow them plenty of light and air, an unusual provision for this part of the city.

The Elliott houses consist of two buildings of 12 stories each and two of 11 stories, with a distance between floors of 8 ft. 6 in. Sharing a 4.7-acre site with an existing 50x85-ft. nonresidential building, the houses will occupy an area of 40,053 sq.ft., or slightly less than 22 percent of the site. The structures contain 2,485 rooms and will house 608 families, or about 2,250 people.

Every building is divided into two units, each of which is served by one high-speed elevator, rated at 200 fpm. Usually, two elevators at 100 fpm. are specified under similar conditions. Thus, a saving of one elevator and shaft was made.

So as not to cause too much inconvenience to the tenants in the event that one of the elevators in a building should be out of service, a cross-over between units is provided on the eighth floor. Thus, at the worst, tenants may have to walk up or down a few floors to get to their destination or to the elevator still in service.

Allowable stresses varied

Throughout the frame of the Elliott Houses, high-early-strength controlled concrete is used. While 2,500-lb. concrete was specified for the floor system, the specifications called for 1,750-lb. concrete for interior slabs on fill and 2,000-lb. concrete for exterior slabs on ground. For the columns, concrete strengths specified vary from 2,500 psi from the seventh floor to the roof to 3,000 psi. from the fourth to the seventh floors and 3,500 psi. for the first four stories.

In the design of the concrete footings for these structures an allowable soil pressure varying from 2 to 4 tons per sq. ft. was assumed. Because of the presence of fine wet sand in some parts of the site, large footings and combined footings, for which the lower pressure of 2 tons was used, are necessary at times.

Slab-band design adopted

The floor system is of the slab-band type (*ENR* Oct. 17, 1946, vol. p. 526) with $13\frac{1}{4}$-in. deep interior beams varying in width from about 30 in. to about 56 in. (Fig. 1). The depth was chosen to conform with originally planned block courses of partitions, but later it was decided to install plaster partitions instead of cinder block.

In a typical wing, which is about 32 ft. wide and about 42 ft. long, a slab band is positioned near the longitudinal centerline and is carried on a row of reinforced concrete columns spaced at intervals that vary from about 8 to 13 ft. Near the exterior end of the wing, two bands cantilever over the last column at right angles to the main band, so that in plan the slab band has a T-shape (Fig. 2).

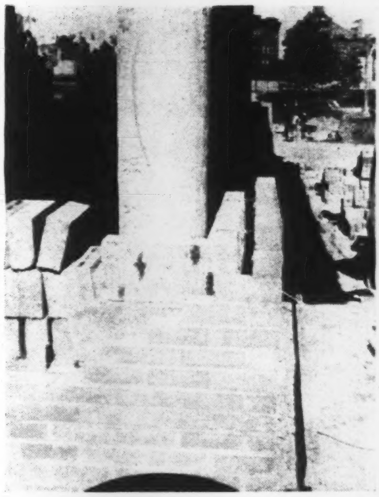


Fig. 3. Cavity-type exterior walls consist of brick and cinder concrete blocks.

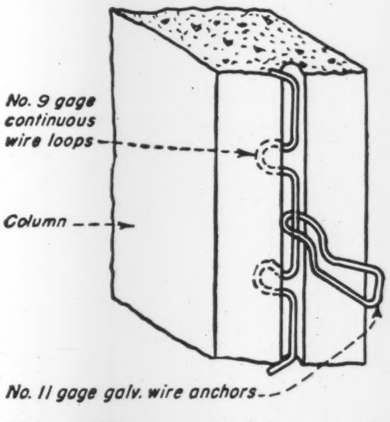

No. 9 gage continuous wire loops
Column
No. 11 gage galv. wire anchors

Fig. 4. Wire loops tie the concrete columns and exterior walls together.

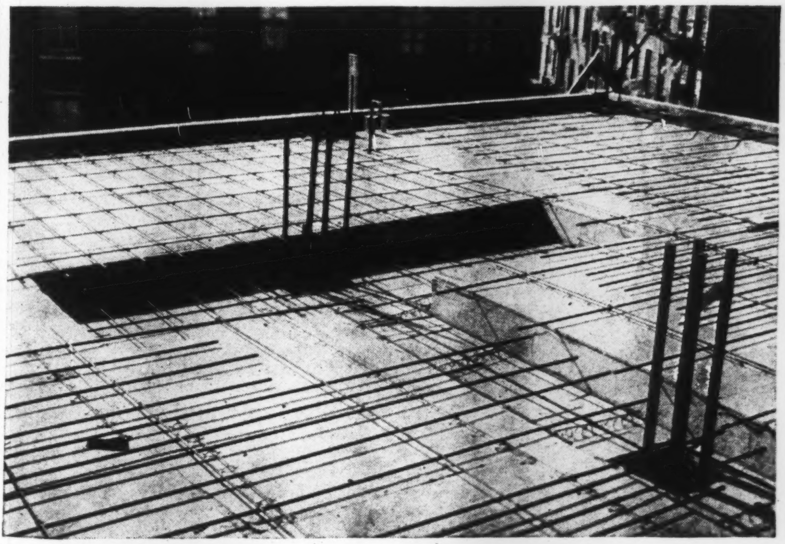


Fig. 2. Concrete for the 5-in. floor slabs and the slab bands was cast in plywood forms. The underside of the slab will be left exposed and painted.

Spanning the exterior rows of columns, which are spaced at intervals varying to the same extent as the interior row, 10-in. wide by 15-in. deep spandrel beams assist the slab band in supporting the 5-in. floor slab. Typical spandrels are reinforced with two $\frac{3}{4}$-in. round bars running full length top and bottom and with additional top bars centered over supports and additional bottom bars centered in the span where required.

In accordance with current practice of the New York City Housing Authority, the underside of the floor slab will be left exposed and painted to eliminate the need for plaster ceilings.

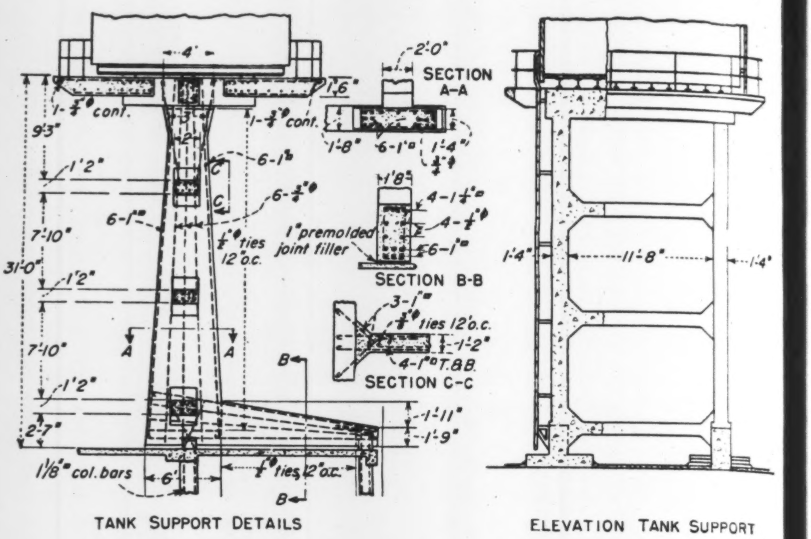
Cavity walls inclose frame

Another unique feature of the Elliott houses is the use of exterior walls of the cavity type. Employed to a great extent in England, this type of construction consists of two panels or withes of some building material separated by an air space. While cavity wall construction has not been used to any great extent in the United States for multi-story buildings, it has been resorted to at times because of its higher insulation value, greater resistance to penetration of moisture and economy over solid wall construction. One such instance is the 7-story Rockliffe apartment house in Montclair, N. J., which was described in *ENR* Sept. 12, 1940, vol. p. 332.

In the Elliott houses, exterior walls from the top of the foundations to the underside of the roof spandrel beams consist of an exterior withe of face brick laid in running band and an interior withe of solid cinder concrete blocks 4 in. thick (Fig. 3). An air space of such thickness as to make the overall width of wall 10 in. is left between withes, and a $\frac{1}{2}$-in. coat of plaster is applied directly to the interior face of the inner withe.

Outer and inner withes are bonded together with $\frac{1}{4}$-in. round bronze ties embedded in mortar joints at about every fifth course. The inner withes are tied to the concrete columns by means of 11-ga. galvanized wire anchors that are coiled around 9-ga. continuous wire loops embedded in the columns (Fig. 4). The 9-ga. wire loops come to the job fastened to wood spacer strips, which are tacked to the inside of the column forms and which are removed after the concrete has set.

The cinder concrete blocks for the


4'
2'-0"
SECTION A-A
1'-6"
1-¾" cont.
9'3"
1-¾" cont.
1'-8"
6-1"
1'-4"
¾"
1'2"
6-1"
6-¾"
C
C
1'8"
4-1¼"
4-¾"
6-1"
7'-10"
¾" ties 12" o.c.
1" premolded joint filler
SECTION B-B
31'-0"
1'2"
3-1"
¾" ties 12" o.c.
1'-2"
4-1" T.&B.
SECTION C-C
7'-10"
A
A
B
1'2"
1'-11"
1'-9"
2'-7"
1⅛" col. bars
6"
¾" ties 12" o.c.
B
1'-4"
11'-8"
1'-4"

TANK SUPPORT DETAILS

ELEVATION TANK SUPPORT

Fig. 6. An 18,800-gal. water tank on the roof of one of the buildings is supported by a two-legged reinforced concrete rigid frame.

interior withe start on the concrete floor slabs with full beds of mortar and terminate at the soffit of the spandrel beams, tightly wedged in place and the joint filled with mortar. Vertical joints are broken 3 in.

At each floor level above the foundations the outer withe is carried on a steel angle fastened near the bottom of the exterior face of the spandrel beam. Flashing is run across the top and exterior face of the spandrel and secured in the outer withe, with cement fill used in the space between the outer withe and the flashing.

Weep holes are provided in the outer withe at floor level and at the shelf angles.

At window openings, the outer withe is cut down to elevations that permit grout setting for sills. Grout is carried across the top of the air space supported on ribbed metal lath, and anchors for the frames are embedded in the grout. Metal window stools and trim are embedded in grout against the inner withe.

Cantilever step supports stairs

Another attempt at economical design may be found in the scissor-type stairways (Fig. 5). In each unit, a reinforced concrete stairway is provided on either side of an 8-in. thick wall, which is of the same type of concrete as the columns on that floor. One end of each 4-in. stairway slab rests in a 1½ x 4-in. key in the wall, but the outer end is free. Three ¾-in. reinforcing bars are passed through a 9½ x 5-in. cutout in the wall located midway between two floors at the intersection of the stairways on either side of the wall. These bars form top reinforcement for a step cast with the stair slabs and common to both stairways. This step acts as a double cantilever beam providing intermediate support for the stair slabs.

Despite the desire for economy, however, considerable care was exercised and attention was given to structural details to maintain high standards in the design. One instance may be seen in the precautions taken to prevent cracks at the exterior wall corners of the buildings near the roof. Two ¼-in. round by 5-ft. 6-in. long bars are specified to reinforce at all exterior corners every sixth course of the brick wall in the top story and at the roof spandrel beams.

Concrete rigid frame supports tank

On the roof of one of the buildings is a combined house and fire tank, 16 ft. in diameter by 14 ft. high, having a 5,000-gal. fire reserve and a total capacity of 18,300 gal. The tank has a flat bottom, a flat top cover, and staves of 3-in. thick red gulf swamp cypress dressed to 2¾ in., with thirteen ¾-in. round wrought-iron galvanized hoops having a tensile strength of at least 60,000 psi.

Located in a wing about 32 ft. wide, this tank is supported on a two-legged reinforced-concrete rigid frame about 31 ft. high with 14 x 24-in. horizontal braces spaced 9 ft. on centers (Fig. 6.) Tapering from 3 ft. wide at the top to 6 ft. at the bottom, the two vertical 16-in. thick legs, which are 13 ft. apart center to center, are cantilevered from 20-in. wide reinforced concrete bases. The top of the bases slopes to vary the depth from 3 ft. 8 in. at the junction with the legs to 1 ft. 9 in. at the outer ends. Each of the bases, which are about 15 ft. long, rests freely on a centrally located interior column, but they extend in opposite directions and are anchored to ex-

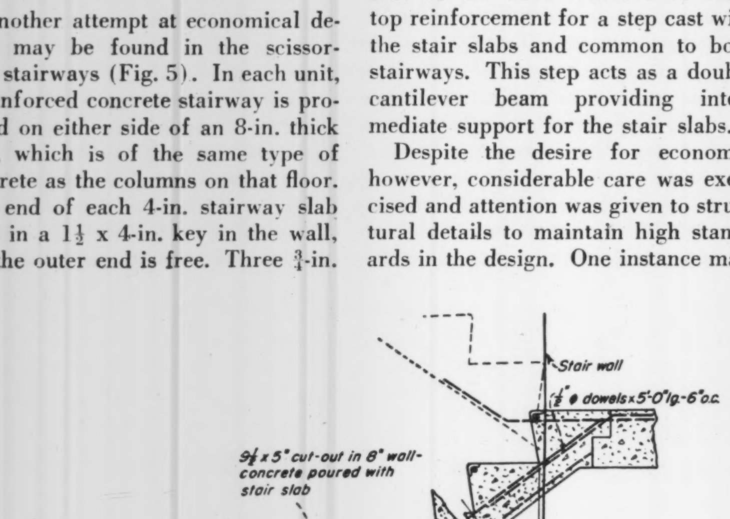

Stair wall
½" ϕ dowels x 5'-0" lg.-6" o.c.
9½ x 5" cut-out in 8" wall-concrete poured with stair slab
3-¾" ϕ full width of stair and hooked
1-⅜" ϕ ea. nosing
⅜" ϕ-12" o.c.
Stair Wall
⅜" ϕ-6" o.c. T.&B.
4" slab
13 tr. @ 9⅝" = 10'-5⅛"
½" ϕ dowels 5'-0" lg., 6" o.c.
1½" x 4" key in 8" wall

Fig. 5. The scissor-type concrete stairway is supported at midheight by a combined step and cantilever beam.

terior columns on opposite sides of the building.

The construction methods used on the Elliott houses were very much like those employed on the Fort Greene houses (*ENR* Aug. 27, 1942, vol. p. 382). Plywood was used for all forms. Concrete came to the job in transit-mixed trucks and was placed directly from bottom-dump buckets without resort to distributing runways and buggies. For construction on the higher floors, this required the use of long booms with gooseneck jibs on the crane, which worked at street level.

In the face of continued strikes—the trucking strike alone virtually halted operations for 35 consecutive days—the progress made in constructing the buildings was remarkable. The first families moved into the first building on Dec. 31. Through teamwork and split-second timing, construction operations were compressed into a period of one month during the latter part of the work that would under normal conditions take between four and five months.

Architects for the Elliott housing project were William Lescaze and Archibald Manning Brown, with Fred N. Severud, structural engineer. The contract for foundations was held by Corbetta Construction Co. and the contract for the superstructures by H R H Construction Co. for whom Knickerbocker Concrete Arch Construction Co. held a subcontract for the concrete. John P. Riley is director of development for the New York City Housing Authority.

ELLIOTT HOUSES CONSTRUCTION COSTS

(Based on Contract award prices)

I. A. Total cost of building, excluding excavation-footings	$3,019,709
B. Number of buildings	4
C. Number of stories	11 & 12
D. Floor to floor height	8 ft. 6 in.
II. Unit cost (Based on total cost of building, excl. excavation & footings)	
A. Cost per apartment	$4,966.63
B. Cost per cubic foot	$0.702
C. Cost per construction room	$1,215.17
D. Cost per person housed	$1,341.50
E. Cost per sq. ft. rentable area	$8.10
III. Space provided	
A. Apartments	608
B. Construction rooms	2,485
C. Persons housed	2,251
D. Rooms per person	1.10
E. Gross floor area—sq. ft	454,342
F. Rentable area—sq. ft	372,534
G. Gross floor area per person—sq. ft	202
H. Rentable area per person—sq. ft	166
I. AIA cube—cu. ft	4,301,454
J. Rentable volume—cu. ft	3,606,086
K. Rentable space per person—cu. ft	1,602
L. Rentable volume per apartment—cu. ft	5,931
M. Area, exterior wall—sq. ft	276,998
N. Exterior wall per person—sq. ft	123
O. Ratio rentable to gross area—percent	82.0
P. Rentable volume per AIA cube—percent	83.8
IV. A. Date of award of construction contract:	
Foundations	Dec. 13, 1945
Superstructures	April 12, 1946
V. Distribution of cost	
A. Primary cost determinants—Basic features (Excavation & footings excluded)	
Type of construction and prevailing practice	Percent
1. Concrete foundations, concrete frame, concrete arches	28.1
2. Walls & partitions, brick & back-up tile	13.3
3. Waterproofing (WP), dampproofing (DP), spandrel WP (SpWP)	0.6
4. Windows, steel casements, caulked	3.0
5. Roofing 4-ply-20-yr.-Celotex insulation	0.7
6. Metal Bucks for interior doors	1.2
7. Kalamein apartment entrance doors	0.7
8. Iron stairs	....
9. Incinerators	0.1
10. Metal furring, lath & base	3.8
11. Plastering, 2-in. solid partitions, none on ceiling	5.5
12. Bathrooms, tile floor & base	0.6
13. Floor finish, asphalt tile	1.6
14. Carpentery, wood interior doors, kitchen cabinets	6.2
15. Glazing, "B" quality ss & ds	0.6
16. Hardware, parkerized finish	0.6
17. Painting, two-coat	3.4
18. Heating vacuum steam-oil-fired	6.1
19. Elevators	3.4
Total cost percentage in basic features	79.5
B. Secondary cost determinants—Influenced by owner's desires.	
20. Plumbing—roughing, brass piping	8.6
21. Plumbing—fixtures, enamel on cast iron	4.3
22. Electric—wiring & conduit, switches, ceiling outlets, receptacles	3.8
23. Electric—fixtures, porcelain, stamped brass	0.4
24. Screens, window, metal	......
25. Shades, window, Holland cloth	0.2
26. Gas ranges, 4 burners, low oven	0.7
27. Refrigerators, electric, 4 cu. ft	2.5
Total cost percentage	100

Note: Similar cost data on other housing projects were given in *ENR* April 18, 1946, vol. p. 96 and 97.

Newark's Slum Costs Exceed Revenue Yield

Slums in Newark, N. J., are costing the municipality an estimated $14 million annually according to a recent study cited by the National Association of Housing Officials.

Emphasizing urgent need for slum clearance throughout the U. S. for economic as well as humane reasons, the Newark study disclosed that in one small slum area the cost of municipal services was 3.2 times as great as the area's contributions to municipal revenues.

In a high-rent residential area studied in Newark for purposes of comparison, the reverse was true—revenues were found to be 2.2 times greater than city expenditures.

Although residential districts usually cost their municipalities more than they yield in revenues, Newark slum researchers observe "There is a limit beyond which communities should not go in supporting residential areas." To the great municipal cost of slums must be added relief expenditures by private agencies.

The Newark study also summarizes reports on ratios of slum expenditures to revenues in 12 other major cities. Slums in Atlantic City before the war cost the municipality nine times as much as they yielded in revenues. In Indianapolis, the ratio was 8.2 and in Atlanta it was 9.9. In Los Angeles in 1942, the ratio was 2.2.

Lower Cost Bridges and How to Get Them

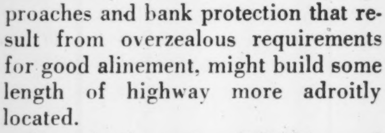
Fred D. Hartford
Bridge Engineer, U. S. Public Roads Administration
Santa Fe, N. M.

***Contents in Brief**—Through familiarity with fabrication and erection practices the bridge designer can plan his structure to avoid costly operations. A reduction of the number of times a piece must be handled in the shop can be effected by the designer. Substituting shop assembly for ultra-exact drilling and reaming will reduce costs, as will elimination of contact surface painting. By choosing a type of truss that requires minimum falsework, erection costs can be brought down. Making joints readily accessible to riveters and welders will bring additional economies in the field. Present high costs of bridges make a thorough examination of design practices worthwhile.*

The rise in highway bridge unit costs has been spectacular. A few short years ago bids for bridge steel erected were 6 and 8c. per lb, now they are 12 to 16. Structural concrete bids are upped from $17 and $20 to $35 and $50 per cu. yd. Timber in bridges, which cost $90 to $110 per 1,000 bd. ft. in place, is now priced at more than $200. All this means the taxpayer is getting about half as much bridge for his dollars as he did in 1941. In addition, most completion dates are mere hopeful guesses.

The highway bridge designer to whom this article is primarily addressed, is not responsible, of course, for increased prices, for material scarcities or for the lack of skilled bridge craftsmen, the principal current troubles that plague bridge building. Nor can he be held accountable for the increased total costs of bridges due to the heavier loadings and greater widths found necessary to accommodate modern traffic; or for costs that result from increase in design speeds, which frequently prevent location on the most economical bridge site in order to get a line and grade throughout the project that meets the requirement in the Standards for Interstate Highways, that "All bridges shall be located to fit the overall alinement and grade." And although no bridge designer can object to this doctrine, since it is vital to highway safety and economy of operation, he would be well within his rights in pointing out sometimes that the cost of skews, curvature, deep and heavy foundations, long approaches and bank protection that result from overzealous requirements for good alinement, might build some length of highway more adroitly located.

If to the foregoing difficulties and costs of bridge building, architects add "blending with the landscape" and bits of classic embellishment here and there, it would seem that everything has then been done to test the bridge designer's ingenuity. About all he can do, in such case is to minimize the effect on costs of some of these appurtenances, by substituting T-piers and square spans for skews, where possible; by increasing fill heights to cut down the length of approach trestles; and by making concrete abutments and piers so simple, clean-cut and straightforward that they make ridiculous the dreamy perspective of grassy banks, cumulus clouds and million candle power searchlights flashing skywards from the parapets —which apparently are characteristic of "bridges of the future."



Warren trusses require support only at alternate panel points. Thus falsework costs can be reduced over some other types.

How the designer can help

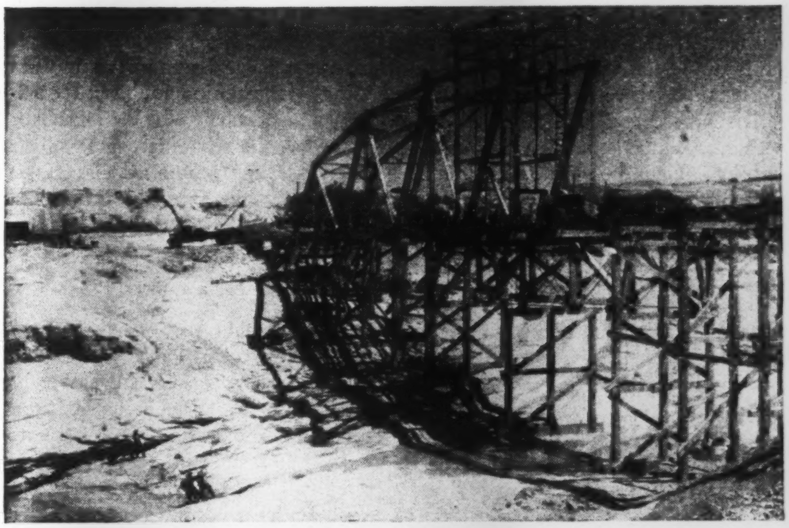
Yet before all responsibility for increased bridge costs is put on other shoulders, let us bridge designers examine wherein we may have added to them without furnishing added utility or beauty. Let us first remind ourselves that since design must finally be expressed in steel or concrete or timber then more than a knowledge of geometrical arrangements and physical properties of materials is necessary. Extensive familiarity with fabrication and erection practice is also required for economy and efficiency.

The present recruitment of untrained men into bridge fabricating and erecting crafts has a somewhat similar parallel in the design branch. Not many years ago designers had a background of responsible work with steel and bar fabricators, machinists and construction contractors. Now college graduates, usually with a wealth of mathematical and laboratory theory at their fingertips, go directly into design departments. Probably it is not the fault of these young men that they cannot spare the time nor undergo the sacrifice of earnings to acquire first hand knowledge of bridge crafts, but it is certainly regrettable. The least design departments can do at this late date is to have one or two of their men with broad backgrounds in fabrication and erection practices pass on all plans not only to insure economy, but also to maintain a reputation among fabricators and contractors alike that the department knows and insists on good practice.

The requirement that the bridge structure must first of all perform its duty is, of course, fundamental but—except perhaps in wartime—it is also basic that overall cost shall be a minimum. For example, savings in steelwork can be made by designers not only through efficient distribution in geometrical forms and dimensions, but also by selection of shapes calling for no extras, no warehouse stock and a minimum number of sections so as to allow prompt carload mill shipments. Machine work on bridges, always an expensive item, may be reduced greatly if the designer knows first hand something about lathes, boring mills, planers, shapers and milling cutters and their economical use. However, many designers shrug off any suggestions on shop or field limitations with the remark, "I make it the way I think it should be. Let the fabricator or erector worry about how to do it."

Economical fabrication, whether of steel, reinforcing bars or timber, depends on shop layout, material handling, diversified hand and machine tools, the safety and morale of workmen, and much more. Economical erection has to do, among many other things, with construction plant layout, material storage, sequence of operations, cofferdams, unwatering, falsework, heavy lifting equipment from jacks to cranes, painting, and again the safety and morale of workmen. By first hand knowledge of the foregoing the bridge designer is prepared to take advantage of practices that will lead to lower costs for his structures.

In discussing the costs of a highway bridge, let us consider a steel truss that a contractor has agreed to erect complete for 14c. per lb. This includes the fabricated steel, shipment to the site, erection by means of suitable falsework and derricks or cranes, riveting and welding, and finally painting. The foundations, deck, paving, and the like would be covered by other items in the contract. Out of the 14c. the contractor might pay a fabricator 8c. for the steelwork f.o.b. cars at the railroad spur nearest the bridge site. His own erection cost and profit must come out of the remaining 6c. a figure that he has determined largely from the method of erection required to attain the desired result. Likewise, the steel fabricator will pay out of his delivered price of 8c. probably not less than 4c. for material and freight, both items beyond his control. This will leave him 4c. for fabrication and profit, a figure that has been set up mainly from the details of fabrication indicated on the design drawings.



A traveler erecting through-trusses usually must erect all parts as it passes. It cannot back-track conveniently. The designer should see that his plans permit the traveler to work straight through.

Ways to save on fabrication

F. W. Dencer in his book, "Detailing and Fabricating Structural Steel," has stated that the handling of the various pieces or shapes in the shop, from the incoming mill shipment to their loading in the outgoing freight car or truck, forms a substantial proportion of the fabricating cost. He cites a plate girder flange angle as commonly handled 16 different times in the shop. If the angle required a few odd size holes it would need still further handling by a crane to and from another punch or drill. This extra handling, incidentally, usually costs far more than the special punching or drilling operation itself. Therefore, the designer who would reduce the cost of his steel will minimize the number of odd size holes and, when they are absolutely necessary, he will confine them to detail pieces that can be transferred to an adjacent punch or drill without a crane.

Another economy is possible in shearing gusset plates in multiple from a standard width of plate, rather than having the various edges at odd angles. Still another is the substitution of perforated cover plates for lacing or other highly fabricated parts. Incidentally, where a large number of plate girders are to be supplied, the design should permit multiple punching of web plates.

However, the foregoing examples, and many similar ones, are minor in effect compared with the duplication of major pieces. Duplication to be an economy does not need to be complete in every detail. Economy requires mainly similar cross sections and gage lines that can be marked on a templet. Holes on gage lines may be added or omitted, or the length overall may be varied, and yet the shop can still realize the economies of duplication. Too, savings by duplication are usually far greater than savings in weight allowed by small decreases in stress.

Since drilling and reaming, compared with full size punching, are expensive and time consuming operations, very careful analysis of the design should be made to secure the maximum amount of full size punching allowed. Reaming to steel templet is also a costly shop operation that can frequently be replaced to advantage by shop assembly, spearing of open holes and match marking. More and more, full shop assembly is gaining favor because it assures high type construction as well as economy. Experienced erectors will bid less for setting such steel work for they know that, by substantially expediting their work, it will lower costs.

One of the most expensive steel fabricating operations, and also one of the most important, is "fitting up." It consists of assembling the various pieces of a bridge member with bolts and drift pins, assuring essential dimensions and then allowing other dimensions to come what they will. This assembly is next sent to the riveting bay where the holes are "speared out" with a reamer, and the rivets driven. For economy it should, therefore, be possible to drive all rivets by machine without disassembly. The use of riveted subassemblies always adds considerably to expense although it is sometimes unavoidable. For example, built-up top chord sections must be riveted and milled before the end gusset plates can be riveted on.

Among further fabricating economies is the elimination of shop painting at riveted contact surfaces, the same as for welded assembly. Contact painting is not only virtually worthless as protection to the parts, but it delays shop work due to loss of time in drying. When used between a large number of pieces it causes misfits that are very difficult to remedy.

Shop painting specifications also can frequently be simplified to make the work less costly. Many designers who may not know how to take a brush out of a paint bucket in the proper way still insist on brush painting in place of cheaper spray painting, as they impute some magic power to bristles in making paint adhere to steel. When spraying is allowed, others insist on no thinner being used —virtually making good spraying impossible.

The foregoing items are representative of a large number of shop economies applying to fabrication that obviously can come from detailed familiarity with such operations. Previously mention has been made that economy of fabrication hinges on morale of shop men. It is impossible to evaluate such an intangible thing in terms of cents per pound of steel, but every shop foreman knows a job that does not fit readily into shop routine, that requires extensive hand work, unusual settings of machine tools and obviously unnecessary refinements moves tediously, thereby increasing costs and lowering profits. These facts can conceivably influence future bid prices given to the same design source.

Design can reduce erection costs

The contractor customarily has the privilege of using any method of erection he wishes. However, he knows there are certain truss forms that lend themselves especially to simple falsework while others require complicated supports. For example, a Warren truss needs a falsework bent only under alternate panel points, a K-truss or a camelback that breaks at every panel point usually requires a bent under each panel point. A tied arch may require no falsework whatever in the channel. If a designer has once had experience with a contractor and battled flood water, drift and endless boulders or quicksand in a stream bed he will appreciate what a saving he can make for his employer if he uses a truss form requiring the least falsework. The contractor may gamble that he will get along without accident or delay when a simple method of erection is apparent, but his bid has usually included a healthy sum for contingencies when there is any doubt in his mind.

One of the rules of the steel erection game is that for economy the traveler or derrick shall start at one end and erect every piece as it moves forward toward the other end. On a through truss the principal reason for this is that the traveler cannot back track unless it is partly dismantled. It is also a general rule that no riveting shall be done until erection and aligning is complete. Accordingly, if certain pieces must be riveted together before adjoining members can be set, then the traveler is delayed, a riveting gang must be hastily organized and, in addition, it may be difficult or impossible to pull the trusses into exact alinement after erection is complete.

Where the traveler rides on the top chord it can be moved backward to erect secondary parts, but still at loss of time. Sometimes an exception to the general rule is made when the main traveler erects only the truss members, bracing and laterals and a second derrick sets the floor system and minor members. It is quite remarkable to even an experienced erector how a partly bolted and pinned truss that is badly out of line on the falsework can readily be pulled into satisfactory position. The designer should recognize this and not require riveting until assembly and aligning are complete.

The various steel handbooks indicate the minimum clearances necessary in driving field rivets. However, these minimums should be avoided like a pestilence, as any designer who has once served in the field on a rivet gang can testify. It should be recalled that the men of the rivet gang may be on a swinging platform high in the air and a cold wind blowing. If these men must cramp themselves and their wrenches, dolly and gun into awkward positions not only does the cost of rivets shoot upward, but also the quality of the riveting goes down.

Difficult riveting is costly

It is vital to sound riveting that the hot rivet be quickly inserted in the rivet hole and the dolly set behind it immediately before any substantial cooling has occurred. If the rivet and tongs must be inserted through a small hand hole and then the tongs withdrawn before the dolly can be introduced and adjusted, there may be so much time lost that the rivet cools appreciably. Such hand holes should obviously be made as large as possible, but it is still better to arrange space for the dolly so that it can be adjusted the instant the rivet is inserted in the rivet hole. The writer has known of several instances where ironworkers walked off the job because workmanlike riveting was virtually impossible. In one case coming to the writer's attention the buckerup had to be lowered head first into a closed chord member, and the hot rivet dropped down past him. The contractor stuck with such a situation would certainly be prejudiced against the designer.

The foregoing give only a few of the many situations where consideration of erection economies will ultimately give lower bridge costs. In our previous example we have allowed the contractor 6c. per lb. for erection and profit, and the steel fabricator 4c. for his own share of the work. It is, of course, impossible even to approximate the savings that can result from thoroughly competent advice in regard to fabrication and erection, when the design department has no men with satisfactory experience in those fields. The writer has seen a considerable number of instances where a saving of at least a cent a pound in each of these operations could have been made. True enough, design costs themselves perhaps might be increased slightly, but overall savings are generally so significant that no design head should hesitate to call in men who know first hand the intricacies of transforming design plans into steel or concrete or timber bridge work. He will obviously enhance his own reputation as well as that of his department for getting better bridges for less money.

The preceding has dealt largely with steel bridge construction, but parallels in concrete and timber could also have been drawn. It is the writer's opinion that the present situation of high material costs and short labor supply may obtain for a sufficient length of time to warrant thorough reexamination of plans drawn in wartime as well as of those now on the boards for possible simplification in shop and field work. Bridge designers ought to scrutinize their plans to assure themselves that their bridges are not outdated while still in the blueprint stage.

Industrial Plant Cost Reaching Peak

E. Warren Bowden
Vice-president, Walter Kidde Constructors, Inc.
New York, N. Y.

THE TOP LIMIT of postwar industrial plant construction costs has about been reached. Reductions that might be expected in the near future are estimated at 9 to 16 percent by one method and 13 to 17 by another.

The prediction is based on the premise that wage levels that have been attained will not easily be reduced and therefore cost decreases will be accomplished chiefly by elimination of excess costs due to labor and material shortages, low job productivity, overtime wages and extraordinary contingency items.

The decline in costs cannot be precipitate. One reason for this belief is that the backlog of demand for new construction is tremendous, and a second is that the skilled-labor shortage will require time and some well-directed effort to correct.

Two methods are used to evaluate the cost reduction that can be anticipated as the factors of excess cost are eliminated. One is by an analysis of the elements of cost of a typical building and the other is by means of a comparison of the cost curves in the adjacent chart.

Briefly, the first method breaks down the elements of cost and possible reductions as shown in the accompanying table. Summation of the percent decreases that might be anticipated in each item yields a possible overall reduction of 9 to 16 percent of actual cost.

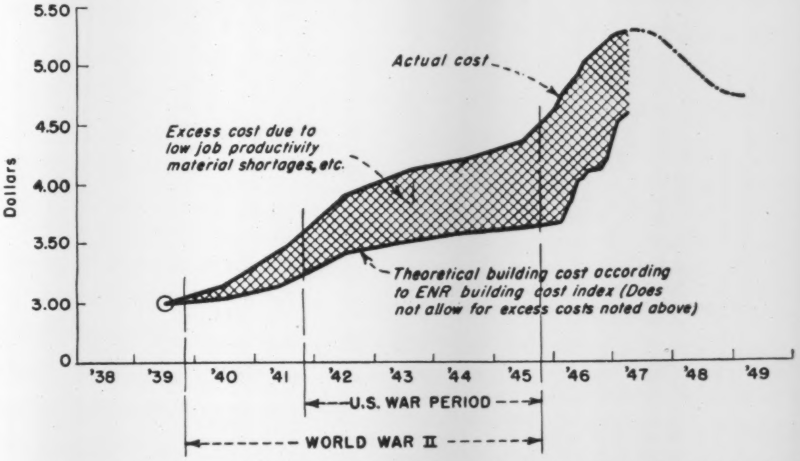
As a basis for the second method, use is made of the variation in cost per square foot of a typical one-story industrial building of fairly large floor area, which, in 1939, could be built at $3 per sq. ft. The lower curve in the chart registers the changes indicated by the *Engineering News-Record* Building Cost Index, and the upper curve shows actual cost of construction. The shaded area indicates, therefore, the excess costs due to low job productivity, material shortages and similar factors, and shows graphically that this excess is about 13 to 17 percent of the actual cost of the work.

As materials become progressively more plentiful and as improvements take place in labor productivity, the difference between the theoretical and actual industrial building costs will decrease. The possible reduction in the actual cost as previously analyzed is checked by the second method.

Prediction of the future movements of such a cost trend in any precise fashion is, of course, impossible, and extension of the cost curve, as shown by the broken line, represents the general path that study leads us to believe will be followed.

ESTIMATED REDUCTION IN COST OF INDUSTRIAL BUILDINGS

Elements of Cost	Proportionate Part—Percent	Possible Reduction in Percent of Total Cost
Site Labor	35	5 to 10
Building Materials	10	1
Fabricated Items	20	1 to 2
Mechanical Items	19	1 to 2
Plant & Supervision	6	1
Engineering & Contractors' Overhead and Profit	10	
Total	100	9 to 16



A comparison of actual costs of construction of a typical manufacturing plant with the cost estimated by means of ENR Building Cost Index indicates that excess costs are about 13 to 17 percent of the total.

Cost Comparisons Aid Selection Of Building Materials and Installations

George Parkman
Director, Building Construction and Maintenance
Westinghouse Electric Corp., Pittsburgh, Pa.

Contents in Brief—*While substructures vary with each site, superstructures of buildings designed by the Westinghouse Electric Corp. Construction Department are of the same general designs. Materials and installed equipment for the standard designs are chosen as a result of cost studies.*

To enable the Westinghouse Electric Corp. to obtain buildings of greatest utilitarian value at lowest initial and operating costs, the Westinghouse Construction Department has developed uniform building designs based on facts obtained through the medium of a comprehensive estimating system. Among the factors taken into consideration in making these studies are initial cost of each component item, maintenance, light reflectivity, heat loss, wearing qualities, and the psychological effect on the workers.

Each plant usually presents a different site problem. Therefore, each site is studied individually, while the superstructure is of the same general design adjusted for climatic and space variations. In the end, each project has a separate estimate prepared that is based on the conditions of the particular location.

A routine procedure has been developed to obtain the necessary data. After the real estate, purchases and traffic, and manufacturing departments have selected a site, the construction department sends representatives to examine foundation conditions, prepare a contour map, investigate the availability of utilities and the existing rates schedules, check building code and zoning requirements, and look into the availability of local construction materials and labor. The problem of factory labor, raw material and finished product transportation is the responsibility of the operating people. With these facts before them, the construction department architects, engineers and estimators are in a position to study the component parts of the project.

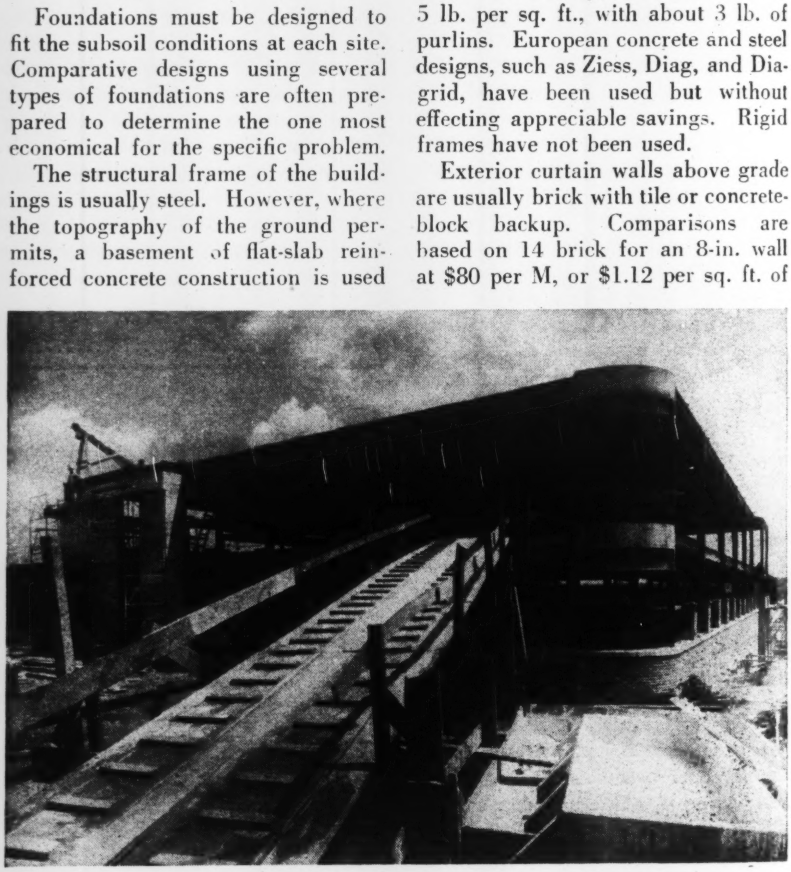
Site characteristics affect design

Foundations must be designed to fit the subsoil conditions at each site. Comparative designs using several types of foundations are often prepared to determine the one most economical for the specific problem.

The structural frame of the buildings is usually steel. However, where the topography of the ground permits, a basement of flat-slab reinforced concrete construction is used to offset high fills and ease deep cuts. Generally speaking, the most open column spacing possible is used to provide flexibility for manufacturing layouts. Most aisles are either 45 or 60 ft. wide, with a column spacing of 25 ft. The steel for this design runs about 12 to 16 lb. per square foot of building, depending on height and crane loads.

Warehouse buildings are framed in structural steel with open-web purlins. In this way, the steel is cut to 5 lb. per sq. ft., with about 3 lb. of purlins. European concrete and steel designs, such as Ziess, Diag, and Diagrid, have been used but without effecting appreciable savings. Rigid frames have not been used.

Exterior curtain walls above grade are usually brick with tile or concrete-block backup. Comparisons are based on 14 brick for an 8-in. wall at $80 per M, or $1.12 per sq. ft. of

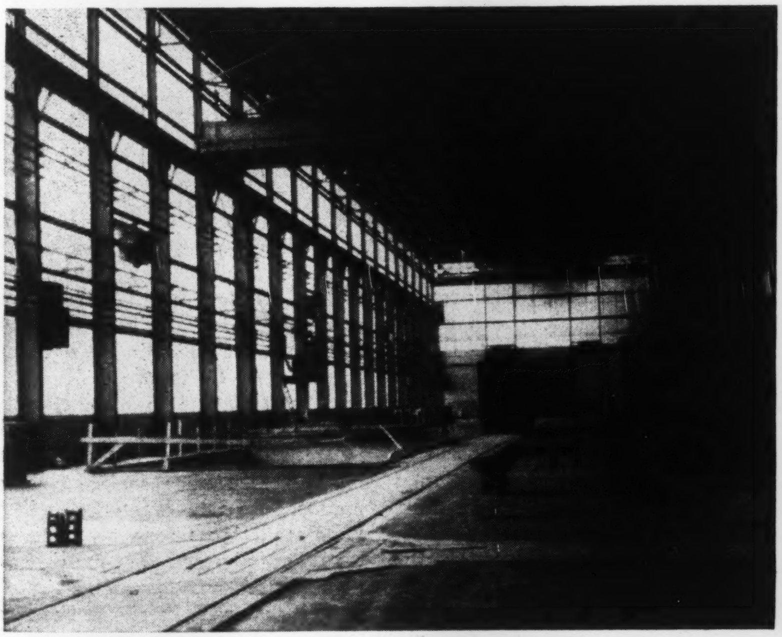


Office building for Westinghouse Electric Corp. has steel frame with open-web joists, cast gypsum roof slab, and brick exterior curtain walls with limestone trim.

wall, against 7 brick at $80 per M plus 2 1-4 smooth-face tile (5 x 4 x 12-in.) at 20 c. each, or a total of $1 per sq. ft. In the case of the solid brick wall, it must usually be painted and then maintained. By the use of a buff smooth-face tile, this painting is eliminated, resulting in an initial saving of 6 c. per sq. ft., and the ensuing maintenance is also avoided.

Cut limestone sills at a cost of $1.10 per lin. ft. are used in most cases. Sometimes, to reduce costs, but at an increase in maintenance hazard and expense, brick sills at 50 c. per lin. ft. are substituted. Prior to the war, extruded aluminum was tried at a cost of 80 c. per lin. ft., and it will again be used when the material becomes available.

Roof monitors were used for this welded steel-frame warehouse because fluctuating light is no problem.



Typical high-bay manufacturing building has steel-frame, cast gypsum roof deck, brick and tile exterior curtain walls, steel sash glazed with heat-absorbing, glare-reducing obscure glass, steam unit heaters for space heating, mercury-vapor high-bay lights. The floor will be surfaced with wood-block.

Standard factory-type steel sash are installed from sill to bottom chord of trusses or roof beams, and glazed with glare-reducing, heat-absorbing, obscure glass, which has three good points. First, it reduces glare, thus helping to reduce worker-fatigue and comfort problems; second, it keeps out heat in summer; third, it keeps heat in during the winter, thus reducing the heating bills slightly. The cost of this material is about 8 c. per sq. ft. in excess of ribbed glass, but the expenditure is justified.

From the top of sash to the underside of the roof deck, corrugated or flat asbestos-cement board is usually used. This material has a lower initial cost by about 3 c. per sq. ft. than corrugated aluminum or painted corrugated galvanized iron. It has no maintenance problem in our experience.

All roofs are of the built-up composition type, using pitch with a gravel or slag surfacing. Selection of the most economical roof deck was was made on the basis of initial cost, heat-loss value and light reflectivity. Usually a 2-in. poured-gypsum slab on ½-in. gypsum board or insulation board is used. This deck costs about 38 c. per sq. ft., with a coefficient of heat loss of 0.25, against 43 c. for metal roof deck with heat loss of 0.39; 59 c. for 2-in. wood deck with heat loss of 0.22; and 48 c. for cement tile with heat loss of 0.37. All decks except the poured gypsum must have ½ in. of insulation applied. The three latter roof decks must be painted on the under side for self preservation and light reflectivity at an additional cost of 6 c. per sq. ft., which is not a necessity with the poured-gypsum construction.

Cost of interior of buildings

For factory use, wood block on a fill of lean concrete is the best floor obtainable. It is also the most expensive, costing about $1 per sq. ft. As a cheaper substitute in warehouse or manufacturing areas where oil is not present, emulsified asphalt can be used at about 30 c. per sq. ft. Maple flooring at a cost of 55 c. per sq. ft. is utilized where light equipment is continually on the move. All these floors wear well and have the resiliency necessary to minimize foot fatigue.

The floor most used, however, is

TABLE I—COSTS OF 400-AMP. BUS DUCT

(Dollars per foot installed, based on 400-ft. length, 20-ft. bays in average steel building and 1947 contractors' labor and material costs.)

Type	Construction Dept. Estimate	Contractor #1	Contractor #2	Contractor #3	Time-Study Estimate	Average
1. Open Bus	$5.90	$5.35	$5.45	$5.60	$5.40	$5.55
2. Square "D" Duct	8.40	6.70	6.75	8.00	7.00	7.35
3. Conduit	8.03	6.25	5.95	8.30	6.45	7.00
4. 400-Amp. 3-Wire Bus Duct	6.65	6.70	6.35	6.60	6.57	6.57

1. Three 500 MCM type "R" cable installed "open"—supported only at each column.
2. Three 500 MCM type "R" cable in 4-in. Square "D" duct. Junction boxes on each column.
3. Same as #2 above, except in 3-in. conduit.
4. Standard Westinghouse 400-amp. plug-in type inclosed bus duct, supported every 5 ft. on standard bus duct hangers.

TABLE II—INCANDESCENT AND FLUORESCENT LIGHTING COMPARED

General Data

	Incandescent (500w.)	Fluorescent (100 w.)
Fixture cost	$7.80	$26.29
Lamp cost	85 c.	$1.80
Lamp Life—hr.	1,000	3,000
Lumens	9,950	4,200

Initial Cost (20 x 20-ft. Bay)

Incandescent cost per outlet—4 at $28.57 = $114.28 per bay or 28 c. per sq. ft.
Fluorescent cost per outlet—4 at $49.08 = $192.36 per bay or 58 c. per sq. ft.

Operating Cost per Year (20 x 20-ft. Bay)
Energy cost per kw.h.—1.5 c.
Burning hr. per yr.—3,500

	Lamps	Energy	Maintenance	Total
Incandescent	$11.90	$105.00	$11.62	$128.52
Fluorescent	16.79	42.00	15.64	74.43

Incandescent maintenance costs are based on cleaning units three times per year at a cost rate of $2 per hr. at a standard time value of 0.13 hr. or 26 c. per unit. Lamp chaning cost is valued at the same cost rate, 0.25 hr. or 50 c. per unit. To this is added $1.50 for miscellaneous repairs.

Fluorescent maintenance costs are based on cleaning units three times per year at a cost rate of $2 per hr. at a standard time value of 0.22 hr. or 44 c. per unit. Lamp changing cost is valued at the same cost rate 0.25 hr. or 50 c. per unit.

To the above is added $5.80, which provides for 4 new starters and one new ballast and miscellaneous repairs.

Summary

	Incandescent	Fluorescent
Total investment cost per bay	$114.28	$192.36
Total operating cost per year	128.52	74.43

integrally finished concrete, at a cost of 8 c. per sq. ft. for the finish. This floor does not have the wearing qualities or the resiliency of the other floors, but its much lower initial cost is usually a determining factor. In office areas, asphalt tile is installed at a cost of 25 c. per sq. ft. Linoleum and rugs are used only in exceptional cases, the former in entrance lobbies and the latter in executive offices.

Interior partitions are usually wood stud or cinder block plastered both sides and painted. Movable partitions of asbestos-cement or hollow metal have been used but only sparingly because of their higher initial cost of $6 per running foot against $2 for the wood stud or cinder block. When changes are made, the special items required to piece out the metal partitions run up the cost to the point where there is no apparent saving.

Factory space heating is accomplished by unit heaters using steam that is generated at from 150 to 650 lb. and then run through turbines and air compressors before exhaustion into the heating system at 15 lb. This is the most economical operation, since theoretically either the compressed air, generated electricity or heat is a by-product obtained at very little cost. Where gas rates are low and steam is not required for processing, gas unit heaters are used.

Positive ventilation through the medium of power-driven roof ventilators is the usual practice. Most buildings are, therefore, designed with flat roofs without the traditional ventilating monitor. In our experience, a building having flat-roof construction with positive ventilation costs 2¼ percent less than a monitor-type building. The expense of operating ventilating fans is offset by the cost of maintenance on the monitors.

Power and lighting costs

Generally, electricity is supplied at high voltage, stepped down in the building's substations, and distributed through network systems, using bus duct as the final distributing medium at 208-120 volts. While bus duct costs more than other types, as shown in Table I, the increased cost is justified by greater flexibility.

Fluorescent lighting also pays for itself. In Table II are some data relating to the initial and operating costs of incandescent and fluorescent lighting, based on a typical 20 x 20-ft. bay with four outlets spaced on 10-ft. centers. Using the incandescent lighting, there would be four 500-w. RLM (Reflector and Lamp Manufacturers) fixtures, and with fluorescent there would be four 100-w. units, each containing two 100-w. lamps. These are comparable in lighting output, giving about 40 to 50-foot candles in either case. The general conditions, such as ceiling and mounting height, reflectivity of the walls and other building conditions, are assumed to be the same for either type of lighting.

According to Table II, the fluorescent system will pay for itself in about 1½ years, based on an energy cost of 1.5 c. per kwh. Obviously, as the energy rate decreases, it will take correspondingly longer to justify the increased investment cost.

Another item studied is sewage disposal. Usually the plant sewer system is divided into storm and sanitary. This is believed to be the best long-term policy in view of public pressure to terminate dumping sanitary sewage into open streams. Toilet rooms are equipped with wall-hung fixtures, which, although costing 15 percent more, make for easier maintenance and greater cleaniless. Metal toilet partitions are used instead of plywood or marble for obvious reasons.

Westinghouse experience has been that no two buildings are ever built under identical conditions, so that to obtain the most utilitarian and economical design, a separate study must be made in each case.

JUST PUSH THE BUTTON

SCHRAMM

Making Air Compressors is the specialized job of Schramm Inc. and has been for the past half century.

When new and advanced features of design that make for improved air compressor service are introduced—you may be sure that they are introduced by Schramm Inc.

Take for example, the electric built-in starting feature of Schramm compressors. No cranking, no injuries; and air in a minute. . . Just touching the button puts your men and tools to work at once.

Other exclusive Schramm Air Compressor features include (1) 100% water cooled (2) Compact—lightweight (3) Mechanical intake valve (4) Forced feed lubrication.

SCHRAMM INC. THE COMPRESSOR PEOPLE
WEST CHESTER, PA.

A development of
B.F. Goodrich
FIRST IN RUBBER

B. F. Goodrich off-the-road tires now have double nylon shock shields

IN SPITE OF the worst kind of terrain, users of B. F. Goodrich Rock Service tires like those shown above, have long reported major savings through shock shield construction, B. F. Goodrich's answer to the problem of impact bruises.

Now, *double* shock shields made of nylon, are used in all large B. F. Goodrich off-the-road tires. The double nylon shock shield consists of four layers of nylon cords between the tread and the plies. These nylon cord layers are in pairs, with each layer of nylon cords running at scientifically determined angles with the other layer to give balanced strength.

The strong, elastic nylon cords in each layer run parallel, fully insulated in live rubber. Under impact the cords in the shock shield stretch together, not across each other, and return to their original position. Because of this principle, impacts are absorbed, *distributed* . . . the rayon cord body is *shielded from shock!*

No make of tire other than B. F. Goodrich gives you the added protection of the *double nylon shock shield* . . . the additional saving through: (1) longer tire life, (2) increased bruise resistance, (3) greater number of recappable tires, and (4) less danger of tread separation.

There are other advantages in B. F. Goodrich Rock Service tires. The directional tread increases self-cleaning, *increases traction!* Too, the bars are joined at the center of the tread, providing a continuous riding band that helps eliminate uneven wear. See the B. F. Goodrich man or write us direct. *The B. F. Goodrich Company, Akron, Ohio.*

Truck Tires BY
B.F. Goodrich

HIGHLIGHTS OF...

Construction Costs—1947

Construction costs rose to unprecedented heights during 1946 and the first quarter of 1947. Despite these rising costs, which had some retarding effect on new construction, total construction volume showed substantial gains during 1946, rising from a weekly average of $75,000,000 in the first quarter to $86,000,000 in the last quarter. Further gains were evident in the first quarter of 1947, when the volume averaged $91,000,000.

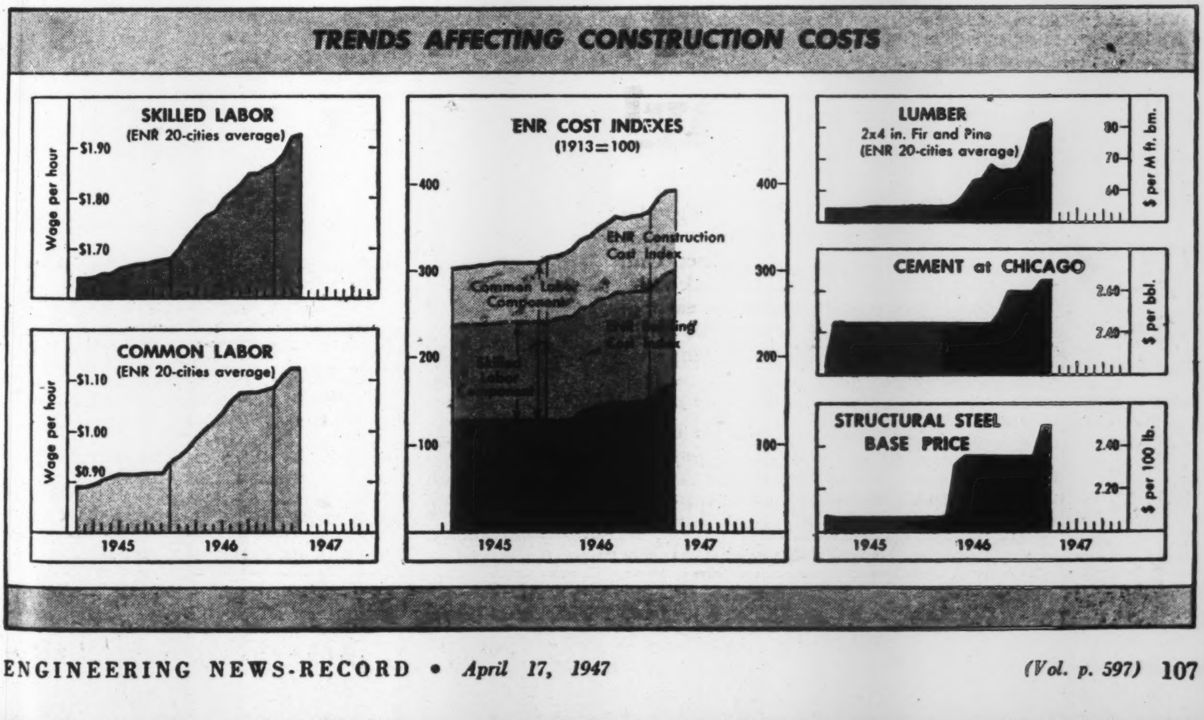
Production of construction materials increased toward the end of 1946 and in the first quarter of 1947. Output was thus catching up with the demand, and supplies are now adequate for immediate needs. During the early part of 1946, steel production was hampered by labor unrest in both the steel and coal industries and by scrap shortages, but the steel industry is now operating at close to capacity levels. Lumber production showed some gains during 1946, and output during the first two months of this year has been running approximately 25 percent ahead of a year ago.

The *Engineering News-Record* Construction Cost Index, on the basis of 1913 as 100, measuring materials prices and wage rate trends, rose to 368.10 in December, 1946 from 313.48 in the corresponding month of 1945, a gain of 17.4 percent. A further increase was evident in the first quarter of 1947, and the index reached 391.93, a rise of 6.5 percent from the December, 1946 index. The wages of common labor, based on *Engineering News-Record* 20-cities average, rose from $.938 per hour in December, 1945 to $1.085 in December, 1946, a gain of 15.7 percent. By the end of the first quarter of 1947, the average of common wages rose to $1.123 per hour, or 3.5 percent above December, 1946.

The *Engineering News-Record* Building Cost Index rose 15.6 percent from December, 1945 to December, 1946, or only slightly less than the 17.4 percent rise in the construction cost index. The building cost index was 240.82 in December, 1945; 278.49 in December, 1946; and 298.82 in March, 1947. The 20-cities skilled labor wage average, on which the wage component used in the building cost index is based, rose from $1.681 per hour in December, 1945 to $1.863 in December, 1946 and to $1.923 in March, 1947.

After rising in May, 1946 to $2.35 per cwt., the structural steel base price remained unchanged until February, 1947 when the price was increased to $2.50 per cwt. This was a gain of 6.4 percent over the May, 1946 price and 20.8 percent over the January, 1946 price of $2.07.

Lumber prices, as measured by *Engineering News-Record* 20-cities average, rose nearly 30 percent from December, 1945, to December, 1946, and an additional 15 percent during the first quarter of 1947.



ENR Construction and Building Cost Indexes

THE ENGINEERING NEWS-RECORD Construction Cost Index has four components: (1) structural steel shapes, base price x 25 cwt.; (2) cement at Chicago x 6 bbl.; (3) lumber, which until 1935 was 12 x 12 long leaf yellow pine wholesale at New York, and since 1935 is 2 x 4 S4S pine and fir in carload lots, *ENR* 20-cities average x 1.088 M.ft.B.M.; (4) common labor, *ENR* 20-cities average of wage rates in force x 200 hrs.

THE ENGINEERING NEWS-RECORD Building Cost Index differs from the Construction Cost Index only in that the trend of skilled labor is used, ENR 20-Cities skilled average x 68.38 hrs. The three material components are the same for both indexes.

For data on converting from 1913 = 100 to other bases see page 111.

Reprints of the colored insert charts on Construction and Building Cost Indexes are available from the *Engineering News-Record* editorial offices, 330 West 42nd Street, New York 18, N. Y., as flat unfolded wall charts, $.50 per chart. Lower rates on quantities.

Engineering News-Record CONSTRUCTION Cost Index—1913 = 100, 1903–1930

Yearly Aver. 1903–'14			1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	
		J	89.22	87.12	112.66	167.75	184 51	198.05	206.55	237.08	168.72	191.70	217.90	210.40	207.15	211.50	203.90	209.40	208.96	J
1903...	93.90	F	89.22	87.36	116.66	167.75	184.51	201.50	225.10	230.67	168.72	197.40	220.30	209.70	206.55	210.15	204.65	210.40	206.46	F
1904...	87.40	M	88.97	87.66	125.16	175.66	184.51	198.05	240.85	224.27	162.04	205.25	224.70	210.20	207.65	208.80	204.65	207.78	206.80	M
1905...	90.55	A	87.97	90.16	129.51	183.41	186.01	191.25	265.20	213.07	164.72	213.50	221.60	209.55	207.50	209.00	206.40	203.40	207.12	A
1906...	95.10	M	88.62	90.16	131.06	187.61	186.01	191.25	268.90	210.82	164.62	216.70	222.38	207.20	207.30	206.80	207.00	205.15	205.86	M
1907...	100.55	J	87.87	88.96	128.71	199.26	186.31	191.85	273.80	209.82	166.62	220.70	216.85	204.60	204.80	205.55	206.15	205.65	203.36	J
1908...	97.20	J	88.12	90.51	127.96	204.01	188.65	193.85	265.65	203.82	169.70	222.10	214.40	204.60	207 80	203.68	206.65	204.77	200.95	J
1909...	90.92	A	90.11	91.76	128.76	198.41	193.85	196.65	252.00	193.47	173.40	221 50	213.15	204.60	208.30	205.50	207.29	205.91	200.95	A
1910	96.33	S	90.36	93.01	131.76	190.31	193.85	202.85	255.20	188.27	185.00	221.50	211.25	202.10	208.30	203.60	207.29	207.57	199.58	S
1911...	93.43	O	88.51	96.16	135.11	167.11	193.85	202.25	255.20	182.57	188.60	220.30	207.55	205.35	209.80	204.40	207.71	206.32	198.72	O
1912...	90.70	N	87.26	101.06	138.16	166.51	193.55	206.85	255.32	166.32	188.60	220.90	205.70	205.95	210.80	201.98	209.46	208.46	198.54	N
1913...	100.00	D	86.51	107.06	149.41	167.11	194.75	206.85	251.62	167.82	192.60	217.30	208.58	205.95	210.80	203.90	210.16	209.46	196.86	D
		Aver.	88.56	92.58	129.58	181.24	189.20	198.42	251.28	201.81	174.45	214.07	215.36	206.68	208.03	206.24	206.78	207.02	202.85	Aver.

Engineering News-Record CONSTRUCTION Cost Index—1913 = 100, 1931–1947

	1931	1932	1933	1934	1935†	1936†	1937†	1938†	1939†	1940†	1941†	1942†	1943†	1944†	1945†	1946†	1947†	
J	194.48	162.48	158.44	191.26	198.22	201.23	221.20	239 62	234.72	238.34	249.69	267.63	283.45	294.57	302.50	316.32	381.68	J
F	196.61	161.82	159.30	194.06	195.07	201.33	222.05	238.99	234.31	238.32	250.50	269.41	283.48	295.05	303.70	319.52	390.76	F
M	194.51	157.24	158.44	194.06	194.41	201.63	224.75	238.79	234.43	238.29	250.71	269.71	285.24	295.34	304.50	323.83	391.95	M
A	191.63	153.12	160.16	195.86	194.65	202.80	231.35	237.95	234.86	238.26	252.40	271.78	288.80	297.70	306.43	334.59	396.09	A
M	189.33	152.78	164.39	199.61	193.96	204.05	233.45	236.80	234.69	238.86	255.55	272.30	289.87	298.00	307.43	a340.50	......	M
J	187.23	152.20	163.41	199.61	196.73	205.08	237.25	236.86	235.02	241.59	256.79	274.19	289.94	298.72	308.99	a348.72	......	J
J	174.37	153.36	165.50	199.65	197.43	204.80	239.90	232.29	234.94	242.15	258.18	277.65	289.92	299.94	308.99	a354.70	......	J
A	171.38	156.80	167.00	198.40	197.45	208.48	240.65	232.39	234.90	242.18	260.41	281.61	291.38	300.42	309.08	361.37	......	A
S	171.40	157.96	175.48	200.58	197.30	208.88	241.62	232.70	234.97	244.13	263.12	281.61	294.09	300.46	309.28	360.19	......	S
O	169.78	159.16	187.74	200.86	197.50	211.53	241.90	234.30	236.86	245.02	264.46	282.44	294.31	301.06	309.28	360.94	......	O
N	169.28	158.20	190.14	201.36	197.35	211.50	241.40	234.40	238.20	247.24	266.13	283.64	294.41	301.09	309.28	362.47	......	N
D	166.23	158.46	192.41	201.86	197.20	215.70	241.05	234.89	238.17	249.12	266.16	283.69	294.51	302.30	313.48	368.10	......	D
Aver.	181.35	156.97	170.18	198.10	196.44	206.42	234.71	235.86	235.51	241.96	257.84	276.31	289.95	298.64	307.74	a345.94	......	Aver.

Engineering News-Record BUILDING Cost Index—1913 = 100, 1910–1947

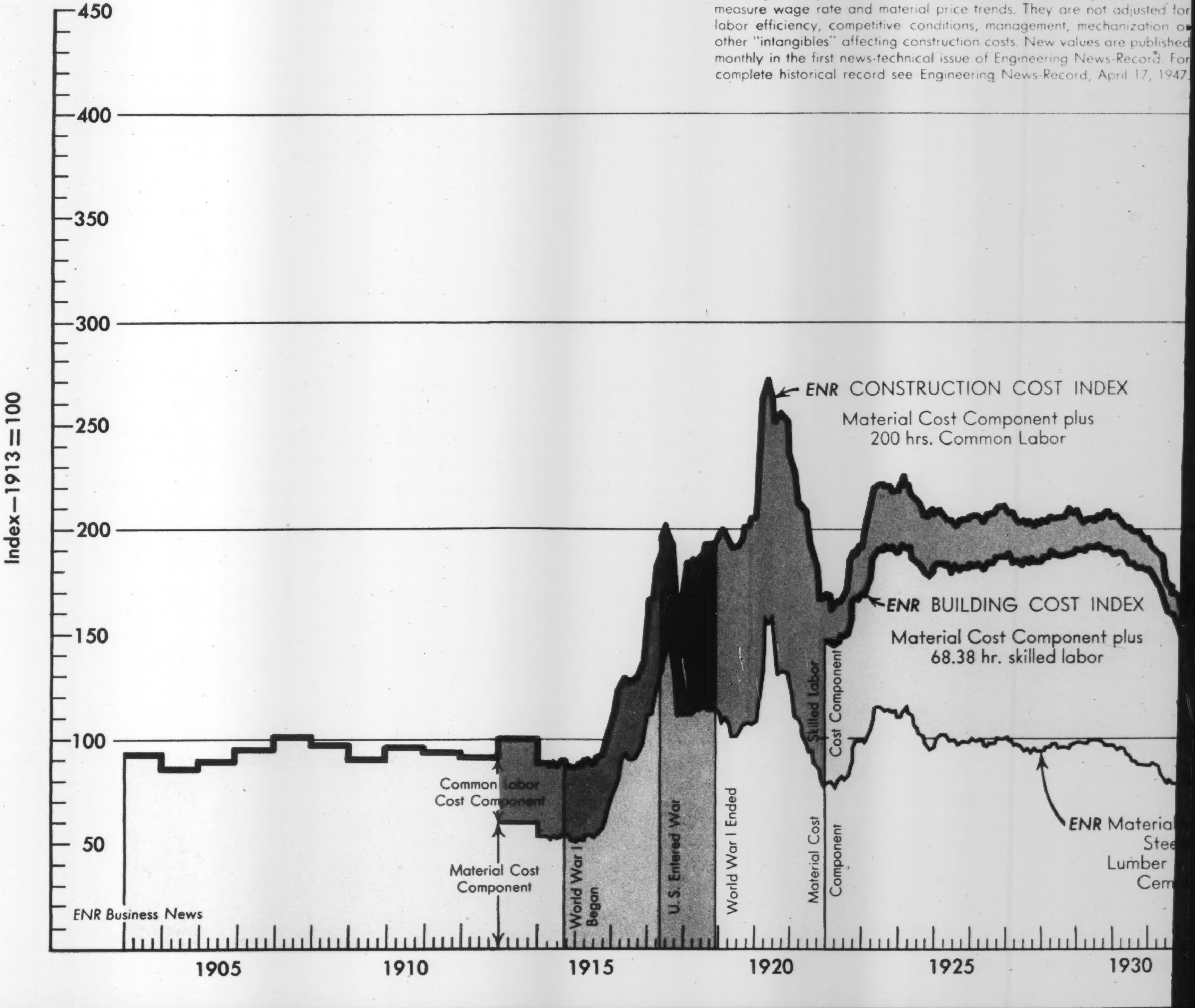
Yearly Aver. 1910–'23			1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935†	1936†	1937†	1938†	1939†	1940†	1941†	1942†	1943†	1944†	1945†	1946†	1947†	
1910...	96.4	J	189.3	182.7	184.3	187.8	185.9	190.0	190.3	180.7	150.6	140.8	160.2	166.5	168.3	185.5	198.6	196.2	201.5	207.9	217.1	226.9	231.6	236.5	242.2	289.1	J
1911...	94.1	F	191.7	184.5	183.7	189.2	187.2	190.0	188.4	182.0	147.2	141.7	161.3	165.8	168.4	186.6	199.0	196.2	201.5	208.4	218.4	226.9	232.0	237.7	243.9	297.7	F
1912...	91.4	M	194.1	184.5	184.3	187.3	187.2	190.0	189.2	180.2	145.9	140.8	161.7	164.1	169.7	187.7	199.3	196.5	201.5	207.9	218.9	226 7	232 3	237.9	245.4	298.8	M
1913...	100.0	A	191.8	184.7	184.1	186.0	188.8	190.0	188.8	177.6	135.7	141.5	163.2	164.4	170.0	195.0	198.2	196.5	201.4	208.6	219.6	227.5	234.5	238.5	254.4	300.8	A
1914...	91.9	M	192.5	182.8	183.6	185.4	190.1	191.3	187.9	174.6	136.4	143.9	168.2	163.3	170.3	197.2	197.9	196.6	201.2	209.2	220.1	227.6	234.8	238.5	a258.1	......	M
1915...	95.3	J	187.7	183.0	181.8	185.8	187.6	192.0	185.4	172.5	137.6	143.2	168.2	164.9	170.2	199.2	198.2	196.4	201.7	209.4	221.2	227.7	235.3	239.4	a265.3	......	J
1916...	130.9	J	184.5	180.2	184.3	183.9	187.6	192.0	183.3	170.5	139.5	144.3	169.2	165.3	170.9	199.8	194.4	196.8	201.7	210.2	223.5	227.9	235.6	239.6	a267.3	......	J
1917...	166.8	A	183.3	183.0	185.1	186.5	187.6	192.8	183.7	163.1	139.4	145.9	168.4	166.2	173.9	200.7	194.5	196.5	201.7	212.5	225.4	228.5	236.1	239.9	a272.3	......	A
1918...	159.1	S	181.4	180.5	185.1	184.6	187.6	191.6	182.4	159.5	139.6	154.5	170.1	166.1	174.3	200.6	194.8	196.6	203.1	214.6	225.5	231.2	236.0	240.1	a272.4	......	S
1919...	158.8	O	178.4	181.8	188.0	186.6	187.6	190.3	181.8	159.5	140.0	157.1	170 2	167.3	175.3	201.0	195.5	198.5	204.0	215.9	225.9	231.3	236.0	240.4	a273.0	......	O
1920...	207.2	N	176.5	182.4	188.0	185.0	188.0	190.3	181.8	158.3	139.5	159.0	170.2	167.3	175.5	200.3	195.6	201.2	206.2	216.5	226.6	231.4	236.1	240.5	a274.0	......	N
1921...	166.1	D	178.4	183.1	188.0	185.1	190.0	190.3	181.8	155.0	140.0	160.7	170.2	167.2	179.3	200.5	196.1	201.2	208.2	216.4	226.6	231.5	236.5	240.8	a278.8	......	D
1922...	154.9																										
1923...	186.0	Aver.	185.8	182.7	185.0	186.1	188.0	190.9	185.4	169.4	140.9	147.8	166.7	165.8	172.2	196.2	196.8	197.4	202.8	211.5	222.4	228.8	234.7	239.1	a262.3	......	Aver.

† Based on 2 x 4 S4S fir and pine *ENR* 20-cities average lumber component instead of 12 x 12 yellow pine wholesale in New York used prior to 1935. For explanation see page C-5 of June 30, 1938 *ENR*. a Revised.

ENGINEERING NEWS-RECORD CONSTRUCTION AN

(1913=100)

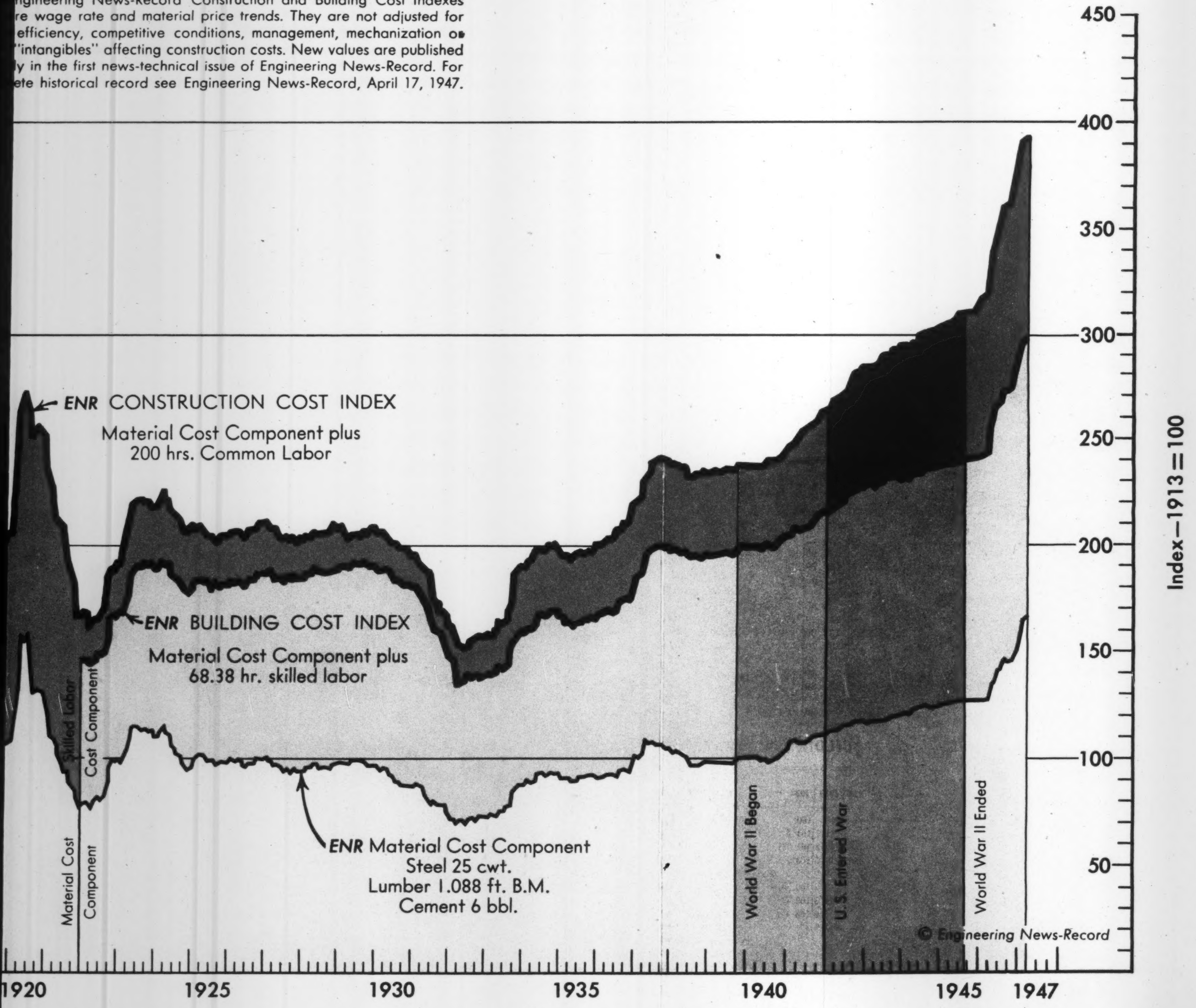
The Engineering News-Record Construction and Building Cost Indexes measure wage rate and material price trends. They are not adjusted for labor efficiency, competitive conditions, management, mechanization o other "intangibles" affecting construction costs. New values are published monthly in the first news-technical issue of Engineering News-Record. For complete historical record see Engineering News-Record, April 17, 1947.



CONSTRUCTION AND BUILDING COST INDEXES

(1913=100)

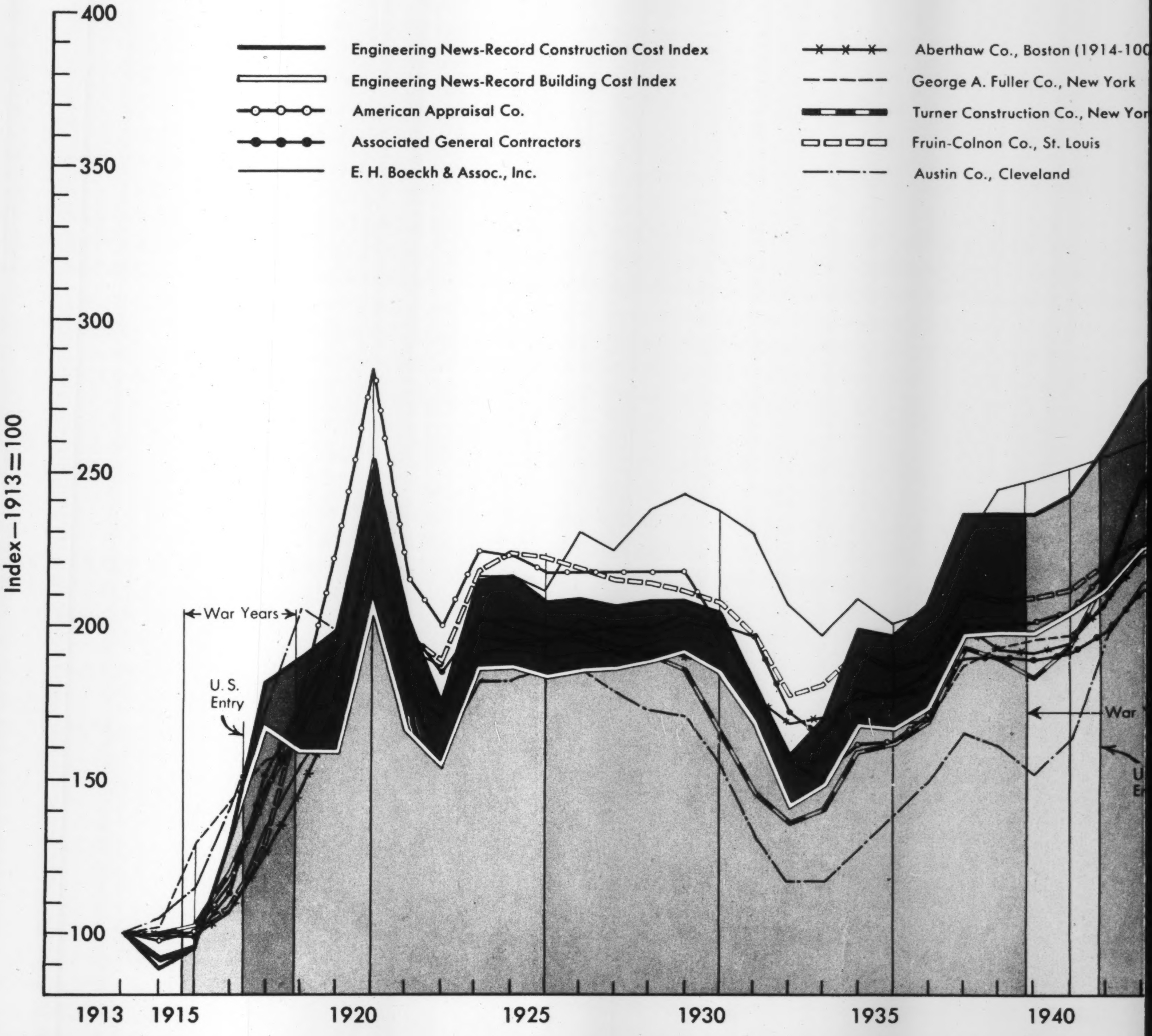
ngineering News-Record Construction and Building Cost Indexes
re wage rate and material price trends. They are not adjusted for
efficiency, competitive conditions, management, mechanization o
"intangibles" affecting construction costs. New values are published
ly in the first news-technical issue of Engineering News-Record. For
ete historical record see Engineering News-Record, April 17, 1947.



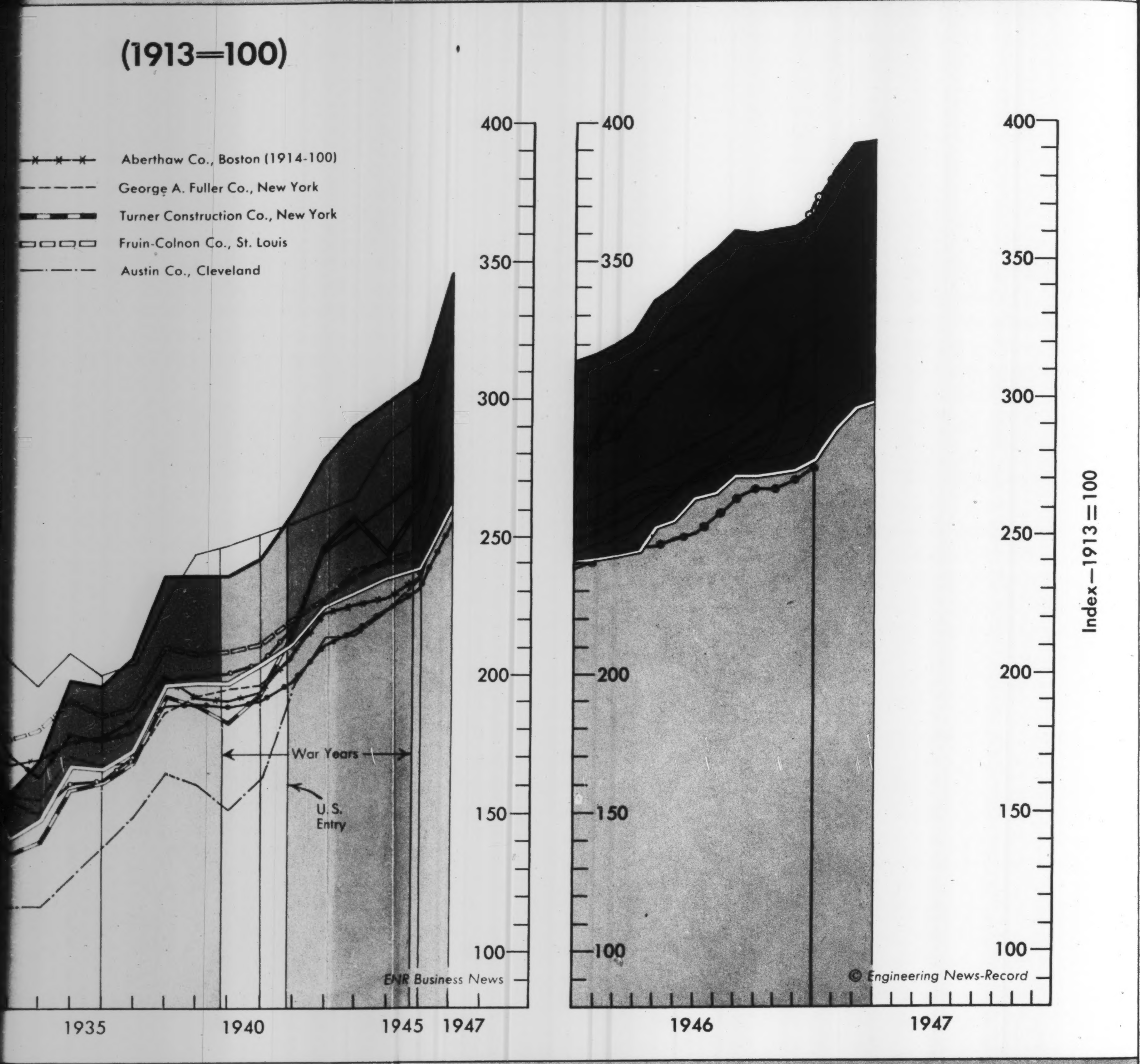
© Engineering News-Record

COMPARISON OF BUILDING AND CONS

(1913=100)



NG AND CONSTRUCTION COST INDEXES



ENR Business News

© Engineering News-Record

Building and Construction Cost Indexes

Composition and historical review of twelve construction and building cost indexes

ENGINEERING NEWS-RECORD CONSTRUCTION COST (ENR Const.) Structural steel shapes, base price x 25 cwt.; cement at Chicago x 6 bbl.; lumber 2x4 S4S pine and fir in carload lots, ENR 20-cities average x 1.088 M.ft.B.M.; common labor, ENR 20-cities average, x 200 hrs. Base: 1913 = 100. See pages 108, 111.

ENGINEERING NEWS-RECORD BUILDING COST (ENR Bldg.)—Structural steel shapes, base price x 25 cwt.; cement at Chicago x 6 bbl.; lumber 2x4 S4S pine and fir in carload lots, ENR 20-cities average x 1.088 M.ft.B.M.; skilled labor, ENR 20-cities average, x 68.38 hrs. 1913 = 100.

AMERICAN APPRAISAL COMPANY (AAC)—Average for 30 cities of four types of buildings: wood frame, brick-wood frame, brick-steel frame, reinforced concrete. Mechanicals not included. Based on actual appraisal costs. Available for individual cities (see page 113). Includes adjustments for social security taxes, unemployment insurance and corresponding "overhead". Base: 1913 = 100.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA (AGC)—Wages and materials for 12 cities combined in 40-60 ratio. Wages, prevailing rates for hod carriers and common labor. Materials, weighted: sand, gravel and crushed stone, 1; cement, 1; lumber, 1; hollow tile, ½; structural and reinforcing steel, ½. Base: 1913=100.

E. H. BOECKH & ASSOC., INC.—Individual series for ten types of buildings for sixteen areas. Weights based on studies of actual building costs—vary with different type of structures. Material prices are those paid by contractors to material dealers. Prevailing skilled and common wage rates from contractors. Base: United States average, 1926-29=100. Series given here is brick and concrete, New York, converted to 1913=100 base. For further definition see page 117.

HANDY PUBLIC UTILITY CONSTRUCTION COST—Compiled and published Jan. 1 and July 1 of each year by Whitman, Requardt and Associates and Benjamin L. Smith & Associates. (See page 119.) Individual series for 81 cost elements in three classes of utility construction, for five geographic divisions of United States.

Weighting based on wide experience in cost analysis of plant and construction. Material prices from Engineering News-Record, Iron Age and various manufacturers. Labor rates from Utilities, Unions and Builders Associations. Base: 1911-'14 =100. The reinforced concrete building construction series is tabulated in this table.

RAILROAD CONSTRUCTION INDEX (ICC-RR)—Compiled by Engineering Section, Bureau of Valuation, Interstate Commerce Commission. (See page 115). Indexes for road (47 subseries), equipment (8 subseries), and general expenditures (7 subseries), for national average and 8 regional areas. Series quoted here is road, subseries 16, station and office buildings, national average. Computed from analysis of contracts covering major construction projects over 30-year period, and other information furnished by carriers. Base: 1910-14=100.

ABERTHAW—Until March 31, 1946, New England seven-story and basement (62'4"x 202'4"), reinforced concrete building built in 1914, repriced quarterly as a construction bid to duplicate original building. Since March 31, 1946, New England, composite of 36 major cost items in three multi-story and two one-story industrial buildings, including all mechanical trades, repriced using actual and estimated labor and material costs. Base: 1914 = 100.

AUSTIN INDUSTRIAL BUILDING COST—Repricing typical one-story, steel frame, monitor type industrial building at regular intervals. Structure has concrete foundations, curtain walls of brick and large areas of steel sash and glass; concrete floor laid on ground; 2-in. lumber roof deck on heavy timber covered with 4-ply waterproofing. Monitor sash equipped with mechanical operators. Pricing at representative points in central and eastern states. Base: 1926=100. Table series converted to 1913=100. See also chart page 113.

FRUIN-COLNON—Industrial plant of five buildings in St. Louis repriced on basis of contractor's actual and estimated material and labor costs. Base: 1913=100.

GEORGE A. FULLER COMPANY—Composite of 36 major cost elements, in three commercial type buildings, including mechanicals, elevators, wiring, heating and ventilating, repriced. Base 1913=100.

TURNER CONSTRUCTION COMPANY—Eastern cities. Own building cost experience applied to these factors: labor rates, material prices, productivity of labor, efficiency of plant and management, competitive conditions. Base: 1913=100.

Reprints of the colored insert charts on Construction and Building Cost Indexes are available from the *Engineering News-Record* editorial offices, 330 West 42nd Street, New York 18, N. Y., as flat unfolded wall charts, $.50 per chart. Special rates on larger quantities.

Construction and Building Cost Indexes— 1913 through 1945

	Weighted Indexes					Aggregative Indexes						
Year Base = 100	ENR Const. 1913	ENR Bldg. 1913	AAC (New) 1913	AGC 1913	Boeckh New York 1913	Handy R. C. Atl. Seab'd. 1911-'14	ICC-RR Sta. & Off. Bldg. 1910-'14	Aber-thaw 1914	Austin Co. 1913	Fruin-Colnon 1913	Fuller 1913	Turner 1913
1913	100	100	100	100	100	...	...	...	100	100	100	100
1914	89	92	98	99	102	...	...	100	105	102	102	100
1915	93	95	101	100	99	...	101	100	115	102	130	103
1916	130	131	116	114	116	153	115	107	141	108	143	120
1917	181	167	143	152	135	233	135	126	172	128	156	147
1918	189	159	177	175	155	242	154	147	206	173	160	166
1919	198	159	229	198	171	237	185	172	198	174	168	196
1920	251	207	283	247	230	260	215	234	241	227	209	252
1921	202	166	216	200	193	207	192	179	180	197	188	183
1922	174	155	200	184	187	165	180	170	157	188	175	175
1923	214	186	224	201	215	199	194	202	181	217	190	196
1924	215	186	222	202	215	226	193	198	181	223	194	194
1925	207	183	217	199	211	219	188	195	185	222	193	195
1926	208	185	217	197	230	213	184	197	185	218	202	195
1927	206	186	217	200	223	208	189	193	178	214	197	190
1928	207	188	217	199	238	205	188	191	172	213	196	190
1929	207	191	217	203	242	211	187	190	170	211	201	185
1930	203	185	200	200	238	200	182	186	155	207	199	165
1931	181	169	178	196	230	184	165	176	131	196	180	145
1932	157	141	155	171	208	165	141	168	117	178	157	136
1933	170	148	150	163	197	159	145	170	117	181	155	140
1934	198	167	161	178	209	186	151	176	128	191	171	160
1935	196	166	162	176	200	190	151	177	139	185	167	162
1936	206	172	170	179	205	192	157	184	150	188	168	169
1937	235	196	198	188	226	208	166	199	165	210	187	192
1938	236	197	199	189	243	210	166	191	161	207	192	188
1939	236	197	200	188	248	206	166	190	152	208	195	182
1940	242	203	204	189	251	210	177	193	163	211	196	193
1941	258	211	217	198	255	228	188	207½	198	220	206	215
1942	276	222	241	209	260	252	208	223	213	227	229	245
1943	290	229	252	216	264	254	219	225	215	235	238	257
1944	299	235	261	223	284	257	227	227	223	241	240	244
1945	308	239	271	231	294	260	244	236	234	247	241	263
1946	346	262	322	257	333	288	...	279	273	279	290	336

World-famous Kinnear Features

Rugged all-steel construction

Coiling upward action that clears door openings completely

Effective counter-balance that assures smooth, easy operation

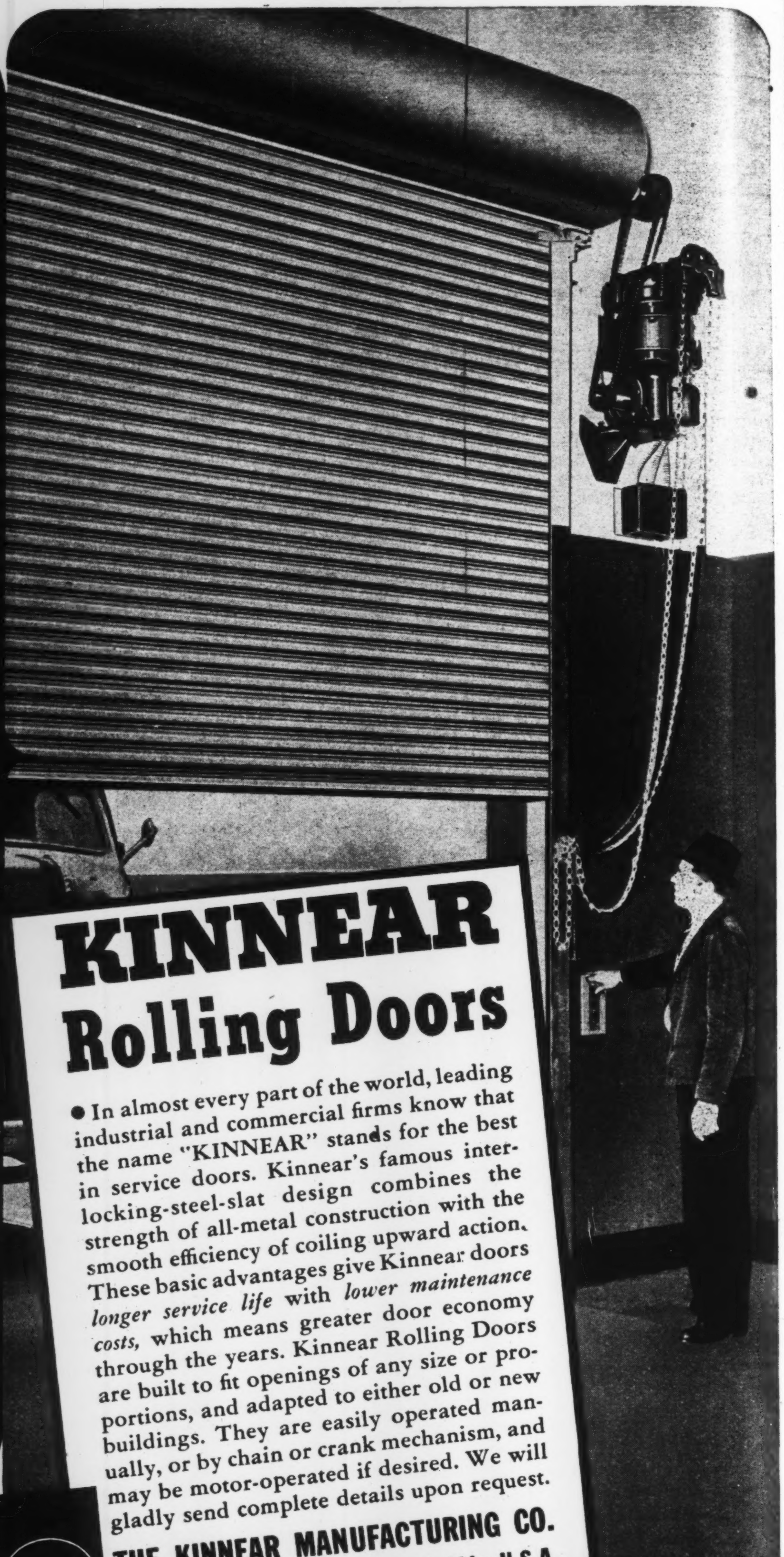
Strong, flexible interlocking steel-slat construction

Complete usability of all floor, wall and ceiling space around doorways

Every door is individually engineered to each opening

Many other important advantages

Kinnear Rolling Doors—the standard for door efficiency for half a century



KINNEAR Rolling Doors

- In almost every part of the world, leading industrial and commercial firms know that the name "KINNEAR" stands for the best in service doors. Kinnear's famous interlocking-steel-slat design combines the strength of all-metal construction with the smooth efficiency of coiling upward action. These basic advantages give Kinnear doors *longer service life* with *lower maintenance costs,* which means greater door economy through the years. Kinnear Rolling Doors are built to fit openings of any size or proportions, and adapted to either old or new buildings. They are easily operated manually, or by chain or crank mechanism, and may be motor-operated if desired. We will gladly send complete details upon request.

THE KINNEAR MANUFACTURING CO.
1820-40 Fields Ave., Columbus 16, Ohio, U.S.A.

KINNEAR ROLLING DOORS

SAVING WAYS in DOORWAYS

Other Bases for Engineering News-Record Cost Indexes

For convenience in comparing cost index rises with prewar conditions the *Engineering News-Record* Construction and Building Cost Indexes are given here for three bases 1926 = 100, 1939 = 100 and 1940 = 100. Many postwar projects had their cost estimates based on 1940 price and wage levels with the proviso that these estimates should be adjusted to future postwar conditions in proportion to the rise in the *Engineering News-Record* Cost Indexes. This 1940 = 100 base series will aid in making these adjustments.

The full historical record of the *Engineering News-Record* Cost Indexes is reported on a preceding page based on 1913 = 100. To convert from this original base year of 1913, on which these indexes are computed, to other bases the accompanying conversion table can be used.

BASE CONVERSION TABLE

To convert Engineering News-Record Construction and Building Cost Indexes

From Base 1913 = 100 To Base	Divide 1913 = 100 Index Values for Construction Cost Index Divide by	for Building Cost Index Divide by
1940 = 100.......	2.4196	2.0281
1939 = 100.......	2.3551	1.9744
1926 = 100.......	2.0803	1.8499
1929 = 100.......	2.0702	1.9086
1910-14 = 100....	.9380	.9477
1924 = 100.......	2.1536	1.8578
1923-25 = 100....	2.1204	1.8481
1914 = 100.......	.8856	.9191
1911 = 100.......	.9343	.9414

Year	ENR Construction Cost Index			ENR Building Cost Index		
BASE	'26 100	'39 100	'40 100	'26 100	'39 100	'40 100
1926 Aver...	100.0	88.3	85.9	100.0	93.6	91.2
1927.......	99.1	87.5	85.2	100.6	94.4	91.7
1928.......	99.4	87.8	85.4	101.6	95.2	92.6
1929.......	99.5	87.9	85.5	103.1	96.6	94.1
1930.......	97.5	86.1	83.8	100.2	93.9	91.4
1931.......	87.1	77.0	74.9	91.3	85.7	83.5
1932.......	75.4	66.6	64.8	75.7	71.3	69.4
1933.......	81.8	72.2	70.3	79.5	74.8	72.8
1934.......	95.2	84.1	81.8	90.1	84.4	82.1
1935.......	94.4	83.4	81.8	89.6	83.9	81.7
1936.......	99.2	87.6	85.3	93.1	87.2	84.9
1937.......	112.7	99.6	97.0	106.1	99.3	96.7
1938.......	113.3	100.1	97.4	106.4	99.6	97.0
1939.......	113.2	100.0	97.3	106.7	100.0	97.3
1940.......	116.3	102.7	100.0	109.6	102.7	100.0
1941.......	124.0	109.4	106.5	114.3	107.1	104.2
1942.......	132.8	117.3	114.1	120.2	112.6	109.6
1943.......	139.4	123.1	119.8	123.7	115.8	112.8
1944.......	143.6	126.8	123.4	125.9	118.8	115.7
1945.......	147.9	130.6	127.1	129.3	121.1	117.8
1946 Aver..	166.3	146.9	142.0	141.8	132.8	129.3
1947 April.	190.4	168.2	163.7	162.6	152.4	148.3

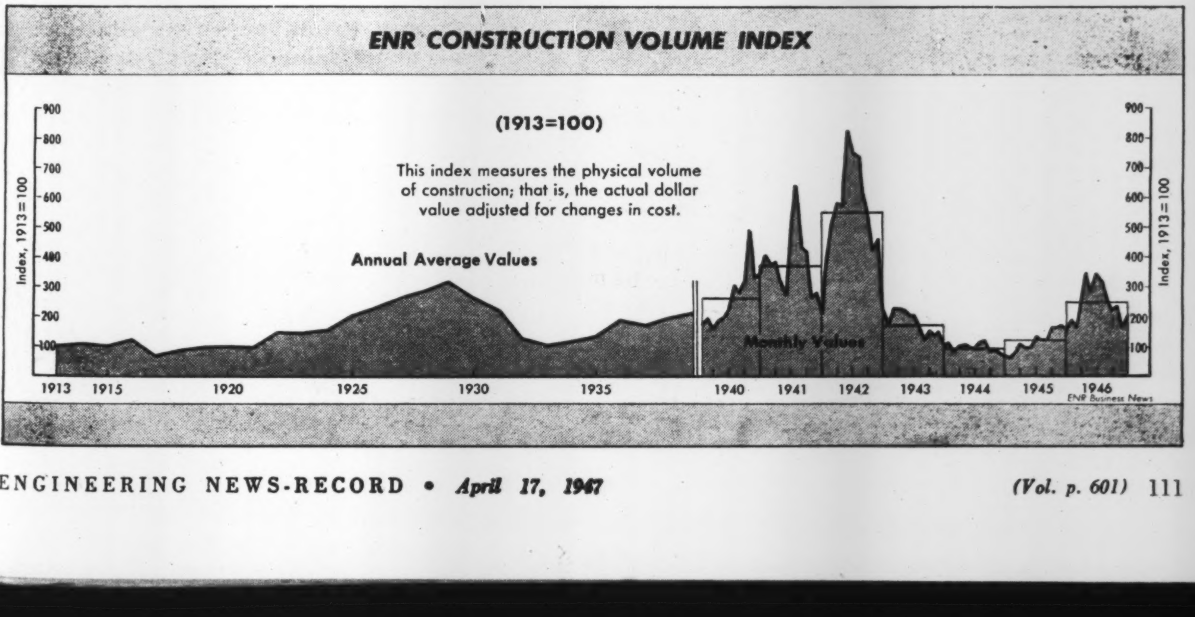
Engineering News-Record Construction Volume Index

As construction costs rise the physical volume of construction materials and labor per dollar invested declines proportionately. The *Engineering News-Record* Construction Volume Index is computed to measure the trend in physical construction. Other construction volume trends are based on dollars invested. For example, March, 1947 construction dollar volume is up 4 percent over March, 1946, whereas the *ENR* Construction Volume Index shows a drop of 14 percent in physical volume, due to the rise in construction costs in this period.

Engineering News-Record Construction Volume Index — 1913 = 100

	'14	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41	'42	'43	'44	'45	'46	'47
Jan....	71	48	96	69	57	38	138	52	100	151	125	141	198	187	208	325	199	208	121	129	149	131	248	168	172	287	173	402	402	172	114	63	189	195
Feb....	83	76	95	47	151	91	130	55	68	129	144	145	187	182	225	378	204	198	105	82	156	75	177	181	189	187	196	374	507	231	86	78	167	197
Mar...	142	75	90	55	90	52	113	90	186	162	161	161	240	226	318	382	408	278	97	62	130	101	157	146	188	210	162	386	578	228	103	103	256	220
Apr....	113	82	137	65	58	78	134	109	161	186	159	211	233	257	316	332	320	289	135	65	109	130	165	160	176	221	191	322	569	225	106	99	345	...
May...	155	96	129	50	67	80	126	108	221	149	191	209	254	290	299	395	354	251	149	103	101	107	148	214	167	232	201	275	821	203	100	93	284	...
June...	128	105	129	57	106	129	92	119	178	173	149	214	246	207	308	347	324	243	131	109	119	120	193	246	166	193	225	492	752	204	91	133	a343	...
July...	139	129	136	87	107	122	83	115	146	151	161	178	248	252	266	320	226	248	166	65	128	95	187	187	207	166	308	635	736	175	114	119	a326	...
Aug....	118	126	130	63	111	135	86	116	137	100	162	266	252	306	306	290	259	187	111	73	94	138	197	152	215	228	281	434	622	119	121	119	258	...
Sept...	96	116	145	166	145	113	80	109	149	166	159	262	227	273	296	340	232	225	124	122	101	125	201	150	213	190	324	419	544	155	85	164	223	...
Oct....	108	101	97	87	67	207	79	130	154	154	164	233	244	269	363	273	211	229	137	162	98	159	180	167	217	222	490	263	421	142	91	167	233	...
Nov....	84	150	105	76	66	71	57	106	114	121	128	194	211	272	251	245	207	180	137	133	115	169	163	148	199	219	331	282	462	149	74	173	164	...
Dec....	62	89	106	49	27	41	63	117	134	123	145	206	188	319	244	166	192	133	113	116	105	252	208	143	249	172	344	217	227	103	66	163	207	...
Aver...	107	100	119	67	86	98	99	96	147	146	154	201	228	263	287	317	260	220	127	102	114	134	185	172	197	211	269	375	553	176	96	123	a250	...

New value reported in *Engineering News-Record* each month.
a Revised.



Buildings that LAST

Plasteel Roofing and Siding Installation
on building at Port of Tacoma, Washington

Roofing and Siding — your building "cover" — is the deciding factor over the years on —

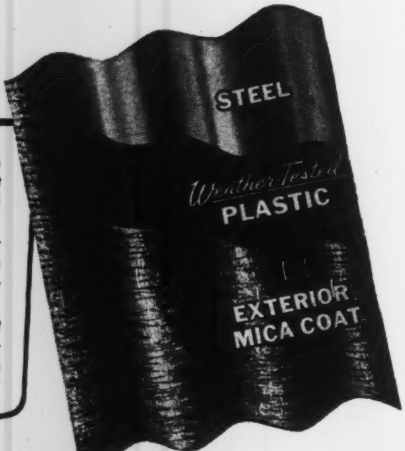
1. **How long your original building lasts—**
2. **How much it costs you for periodical painting and maintenance—**
3. **How often you have to make costly repairs and replacements.**

That is why in choosing your building "cover" you should choose one that insures *permanency* — that you can apply and forget — not one that requires periodical expense of painting, maintenance and replacements.

1. STEEL—For strength—durability—light weight—and small bulk.

2. PLASTICS—For air-tight protection against rust and corrosion.

3. MICA—Finish coat for "weather" protection and pleasing appearance.



PLASTEEL

the modern Roofing and Siding is steel permanently protected (all over) by a specially developed plastics coating. It resists corrosive atmospheres — rust — salt spray — weather — heat and cold. Never needs painting—lasts indefinitely — and gives your building a pleasing appearance. Choose permanency — choose PLASTEEL.

Write for samples and name of your local Distributor.

PLASTEEL PRODUCTS Co.

General Office and Plant • Washington, Pennsylvania

American Appraisal Company Construction Cost Trend Index — 1913=100

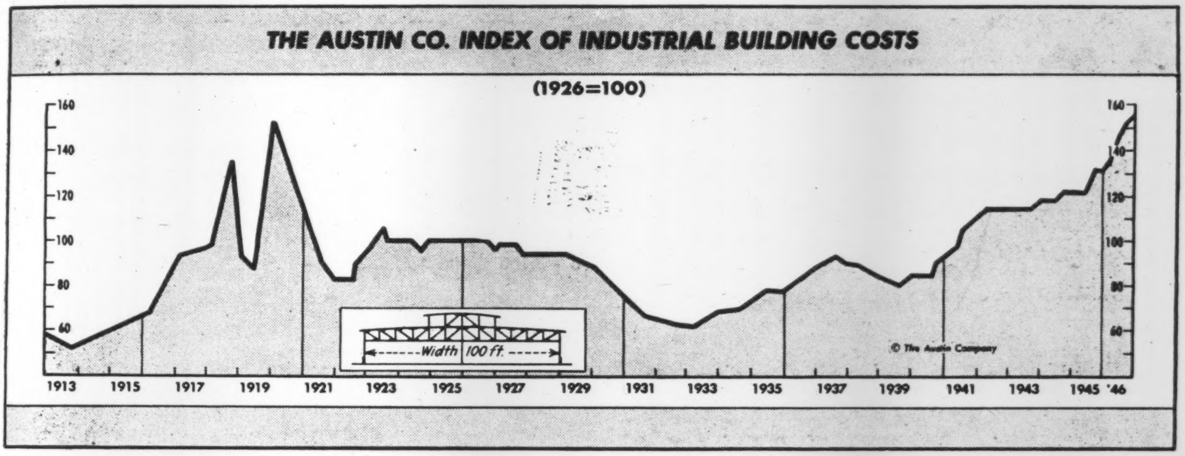
For average of four types of buildings: All Frame, Brick-Wood Frame, Brick-Steel Frame and Reinforced Concrete.

These indices cover structural items only, and do not include factors for Plumbing, Heating, Lighting, Elevators, etc.

	'14	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30
U. S. AVER...	**98**	**101**	**116**	**143**	**177**	**229**	**283**	**216**	**200**	**224**	**222**	**217**	**217**	**217**	**217**	**217**	**200**
	24 Cities																
Boston	100	103	118	149	183	234	288	220	209	232	229	224	224	222	222	224	212
New York	99	100	115	142	175	227	299	245	219	245	241	230	234	234	235	237	219
Buffalo	98	99	115	144	180	232	278	214	197	228	225	218	219	217	213	212	195
Baltimore	97	99	116	150	193	239	289	215	206	233	229	226	224	226	227	228	211
Philadelphia	98	102	115	145	181	236	300	220	201	232	230	224	225	228	227	227	209
Pittsburgh	97	99	115	142	179	231	290	221	201	228	238	233	236	237	236	236	217
Cincinnati	99	100	115	143	173	217	276	211	194	221	221	219	217	219	219	220	202
Cleveland	97	99	120	149	179	233	303	227	210	241	243	236	233	231	232	232	213
Chicago	97	100	116	141	170	224	294	226	202	228	225	224	219	222	222	222	205
Indianapolis	102	104	119	146	175	221	279	221	202	225	227	222	219	222	224	224	206
Detroit	99	102	122	150	187	244	304	220	200	229	227	226	224	222	221	220	202
Milwaukee	100	103	120	150	178	237	290	212	195	224	224	217	218	219	220	218	197
Minneapolis	98	100	114	142	171	218	277	210	193	214	208	201	197	197	197	198	182
Kansas City	98	102	120	150	184	239	280	220	211	231	228	220	220	215	213	213	193
St. Louis	97	100	114	141	175	228	284	225	204	228	238	233	230	226	225	224	205
Atlanta	97	98	111	140	186	250	304	218	202	226	217	209	211	214	215	215	195
Dallas	100	105	121	145	176	227	274	209	191	209	206	198	204	204	202	202	187
New Orleans	97	96	113	136	174	239	282	217	201	225	227	216	217	218	215	215	198
Denver	100	102	118	145	171	216	262	206	191	202	206	204	204	202	205	207	189
Seattle	96	101	115	141	176	224	268	197	186	207	206	201	199	195	194	198	184
San Francisco	97	104	118	139	169	214	258	204	189	208	199	194	188	188	188	190	177
Los Angeles	97	102	112	133	162	213	251	208	199	213	204	197	195	193	193	196	178

	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41	'42	'43	'44	'45	'46
U. S. AVER...	**178**	**155**	**150**	**161**	**162**	**170**	**198**	**199**	**200**	**204**	**218**	**241**	**252**	**261**	**271**	**322**
	30 Cities															
Boston	195	169	163	170	169	178	212	209	210	214	225	248	254	260	270	320
New York	201	170	167	176	174	182	213	216	219	223	233	248	254	265	272	327
Buffalo	178	157	150	160	158	165	202	206	205	207	221	247	256	270	279	328
Baltimore	186	166	158	167	173	180	200	200	198	200	220	248	256	265	277	335
Philadelphia	190	161	156	166	166	171	193	194	196	207	225	247	254	263	273	317
Pittsburgh	198	172	161	170	168	177	211	219	219	219	225	249	259	266	279	325
Cincinnati	176	157	151	161	162	174	206	209	209	213	223	242	250	266	272	317
Cleveland	188	160	151	164	168	175	208	207	206	209	224	245	249	258	268	319
Chicago	185	162	156	166	169	179	204	205	205	207	216	235	244	250	260	303
Indianapolis	182	157	150	161	161	169	199	204	205	209	233	247	257	266	276	327
Detroit	174	148	146	157	160	168	203	205	207	212	226	252	259	268	278	335
Milwaukee	163	144	141	156	163	178	208	208	209	213	225	254	264	269	280	328
Minneapolis	165	148	146	154	154	162	199	201	202	203	214	235	241	251	266	310
Kansas City	178	156	149	160	162	169	202	209	209	211	221	239	249	256	268	321
St. Louis	188	163	156	166	164	171	207	207	207	211	220	238	245	253	265	314
Atlanta	173	147	142	162	163	170	192	185	187	193	215	240	257	267	278	344
Dallas	168	146	139	149	148	154	170	168	171	173	187	209	224	236	246	291
New Orleans	170	145	141	159	159	166	186	187	194	202	214	234	244	259	277	324
Denver	168	149	141	150	151	157	190	193	195	199	209	226	233	237	245	297
Seattle	159	141	136	150	154	161	194	193	195	200	219	244	255	267	277	324
San Francisco	158	144	138	145	144	155	178	176	180	181	201	225	232	237	244	297
Los Angeles	157	141	134	142	140	143	165	166	167	166	183	213	236	240	249	307

NOTE — These construction cost index figures are based on 1913 as 100% for each individual location, thus indicating the trend in each city and not the trend between the various locations. The index figures are calculated on the basis of normal average material prices, average labor wages, and the market conditions in the individual cities and do not reflect extremes such as premium prices and overtime wages for rush work during boom periods or the "extreme low" of cut-throat practices during the "depression periods."



THE AUSTIN CO. INDEX OF INDUSTRIAL BUILDING COSTS

(1926=100)

Man-Hour Estimates per $1,000,000 Expenditure for Various Types of Federal Construction Projects

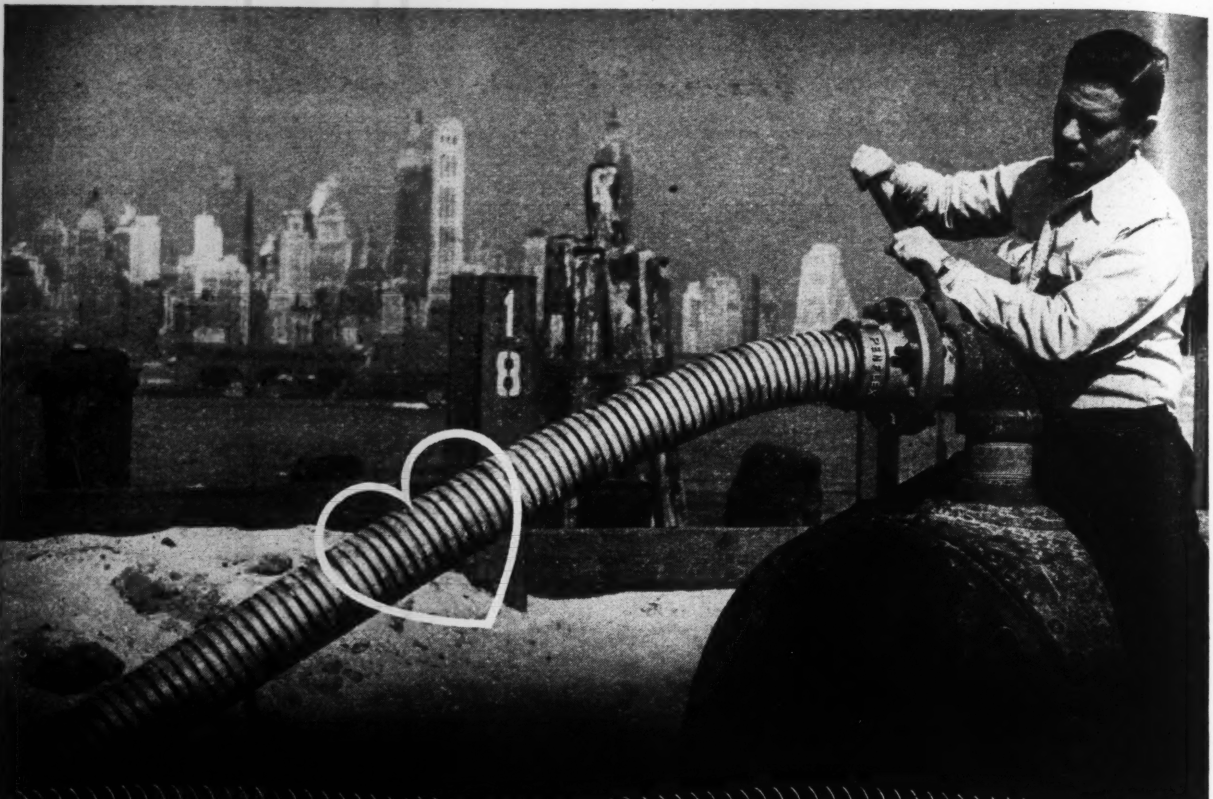
Estimated by U. S Dept. of Labor, Bu. of Labor Statistics, Employment and Occupational Outlook Branch, Div. of Construction and Public Employment

Type of Project	Total Man-Hours (in Thousands)				Ratio: Man-Hours Off-Site to Each Man-Hour On-Site				Cost per Man-Hour			
	1933–38	1943	1944	1945	1933–38	1943	1944	1945	1933–38	1943	1944	1945
Building Construction:												
Residential[1]	1,025	732	710	659	1.50	1.335	1.50	1.50	$0.98	$1.11	$1.15	$1.21
Non-Residential	1,001	...	711	...	1.91	....	1.50	....	1.00	....	1.16	....
Military Buildings[2]	.....	703	728	657	....	1.27	1.30	1.30	....	1.14	1.13	1.27
Industrial Buildings	.....	...	703	622	....	....	1.40	1.40	....	....	1.19	1.34
Warehouses	.....	...	711	...	....	....	1.50	....	....	....	1.16	....
Hospitals	.....	705	798	663	....	1.185	1.50	1.50	....	1.14	1.03	1.23
Ordnance Plants	.....	733	...	...	....	.85	....	....	....	1.13	....	....
Other Types	.....	712	...	645	....	1.26	....	1.50	....	1.15	....	1.27
Non-Building Construction:												
Water Supply Systems	1,138	757	...	...	3.34	1.18	....	....	0.88	1.12	....	....
Sewers and Sewer Systems	1,025	743	...	...	1.86	1.345	....	....	0.98	1.08	....	....
Water and Sewer Systems	.....	...	712	668	....	....	1.30	1.30	....	....	1.14	1.21
Streets and Roads	1,144	754	650	688	1.41	1.33	1.30	1.40	0.87	1.045	1.14	1.02
Airports[3]	.....	...	713	634	....	....	1.50	1.50	....	....	1.06	1.25
Reclamation Projects	1,047	...	...	697	1.60	....	....	1.60	0.95	....	....	1.08
Steam Power and Light	781	...	...	...	3.85	....	....	....	1.28	....	....	....
Diesel Power and Light	802	...	...	...	3.90	....	....	....	1.25	....	....	....

---

[1] War housing in 1943. [2] Includes barracks, mess halls, and recreation buildings at military posts and stations. [3] Excludes buildings.

Note.—Similar data was not compiled by the Bureau of Labor Statistics for the year 1946.



TUBING TAMES A TUNNEL PROBLEM

Penflex "Flexineering" solves air transmission problem on new Battery-to-Brooklyn tunnel project

Far out in the East River an island is growing. It's "man-made" for the Battery-to-Brooklyn tunnel project . . . and presents many construction problems. One was transmitting compressed air from a nearby floating unit of compressors, over the water, and on to the island for powering pneumatic tools used in construction operations.

That's where Penflex Engineers went to work. Ordinary air lines would not stand the pressure. Rigid pipes were not practical due to constant motion of the river. Result? "Flexineering" presented the right answer by specifying Penflex Tubing from compressor unit to the main air lines. Plenty of motion . . . plenty of pressure . . . yet entire job is safe and working steadily under all conditions.

Penflex "Flexineering" (the science of engineering each type of flexible metallic tubing to the particular problem) can help you solve many problems of maintenance, production, and designing of products.

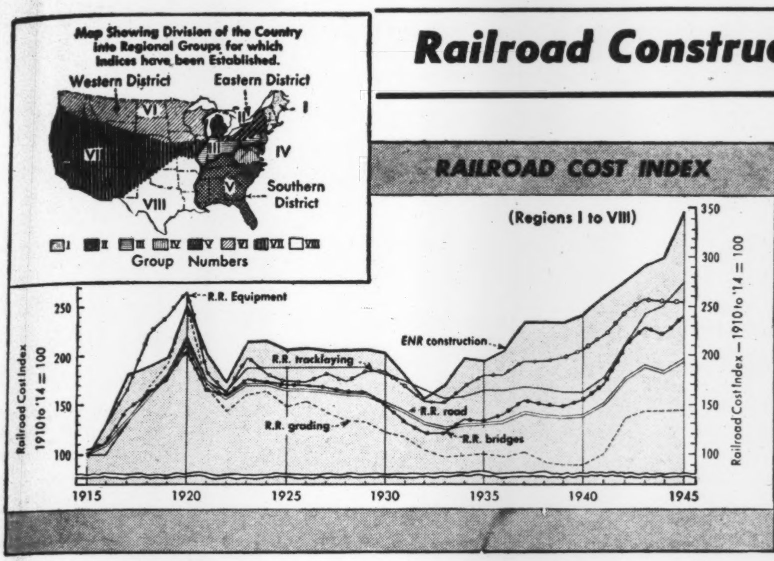
Penflex manufactures a complete line of 4-wall interlocked flexible metallic hose from 1/8" dia. to 30" dia. Also, seamless welded flexible tubing from 5/32" dia. to 2" dia., automatic barrel fillers, rivet passers, accessories and fittings. We offer our engineering service and products to improve your production. For further information on the above tunnel case history, write today to Dept. 2.

PENFLEX SALES COMPANY
Division of
PENNSYLVANIA FLEXIBLE METALLIC TUBING COMPANY
72nd Street and Powers Lane **Philadelphia 42, Pa.**
BRANCH SALES OFFICES—NEW YORK • BOSTON • CHICAGO • CLEVELAND • HOUSTON • SYRACUSE

Penflex... HEART OF INDUSTRY'S LIFE LINES

Copyright 1947—Penflex Sales Co.

Railroad Construction Cost Indexes



THESE INDEXES by Engineering Section, Bureau of Valuation, Interstate Commerce Commission, include items developed from analysis of major construction contracts over a period of 30 years. Indexes for material accounts are based on studies of carriers' returns to Valuation Order 14, joint studies made with various sub-committees of Presidents' Conference Committee, well-known engineering and trade publications, contracts covering major construction projects over a period of 30 years, and other information furnished by individual carriers.

Railroad Cost Indexes for Regions by Years for "Road" Construction — 1910-14 = 100

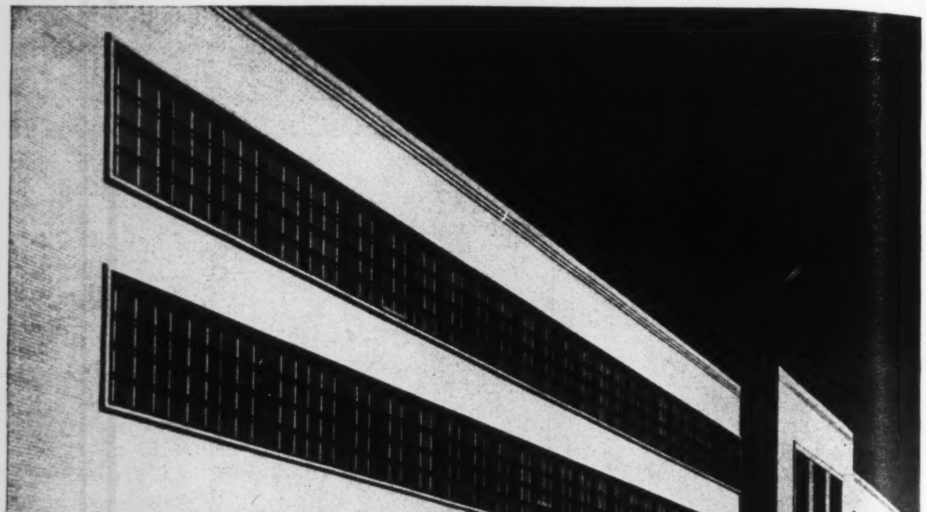
Total of Accounts 1-46, ROAD, Engineering Section, Bureau of Valuation, Interstate Commerce Commission, August 1, 1945

Regions	Per Cent	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
I to VIII...	**73.09**	**175**	**157**	**171**	**171**	**166**	**166**	**164**	**161**	**160**	**152**	**143**	**131**	**127**	**131**	**131**	**133**	**142**	**138**	**137**	**140**	**151**	**175**	**186**	**187**	**197**
I.........	75.36	178	163	177	178	172	173	171	167	166	158	148	134	131	133	134	136	146	141	140	144	156	180	193	194	206
II.........	68.15	176	160	174	174	168	168	167	165	164	157	145	133	130	134	134	136	146	142	141	145	156	178	189	191	202
III........	67.99	176	160	173	173	169	168	167	164	163	155	143	132	129	133	133	136	146	142	144	146	157	179	192	194	205
IV........	70.49	173	152	167	166	164	163	159	155	154	145	133	126	122	125	126	127	137	132	131	135	146	172	184	186	195
V.........	76.66	171	153	168	167	163	164	160	156	156	148	137	129	125	129	128	131	141	137	136	139	149	175	185	186	195
VI........	77.41	175	155	169	170	163	164	162	158	158	150	138	129	125	128	128	129	139	134	132	135	145	171	182	183	190
VII.......	75.62	177	158	170	170	165	166	163	160	158	151	139	131	128	130	129	131	140	135	133	135	145	162	179	181	188
VIII......	78.15	173	157	171	171	166	167	164	161	161	154	143	133	130	133	134	135	144	141	140	142	153	175	187	187	198

(Indexes represent territorial index factors and are not necessarily applicable for determining unit reproduction costs upon individual roads.)

Railroad Cost Index by Accounts Applicable to Entire U. S., Regions I to VIII, Inclusive

"Road" Construction	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
Engineering............	175	157	171	171	166	166	164	161	160	152	143	131	127	131	131	133	142	138	137	140	151	175	186	187	197
Grading...............	170	143	160	164	149	153	143	135	133	123	118	106	98	100	101	99	103	93	90	90	99	135	142	143	144
Underground Power Tubes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tunnels and Subways....	179	165	179	179	179	178	169	155	155	143	130	119	111	122	120	130	139	141	140	149	160	192	223	219	236
Bridges, Culverts, etc....	165	160	176	173	171	170	168	164	163	150	134	122	122	136	135	141	155	150	149	156	174	210	227	222	240
Elevated Structures.....	150	153	173	171	168	165	163	163	162	154	144	129	122	136	136	137	158	150	149	159	175	209	236	231	249
Ties..................	189	157	177	175	172	173	175	176	175	170	155	144	139	149	147	150	159	154	158	164	181	199	228	234	241
Rails.................	158	144	145	145	144	144	144	144	144	144	144	140	134	123	123	124	143	139	136	138	139	144	144	146	152
Other Track Materials...	192	161	182	179	177	177	177	177	170	169	165	163	158	150	147	150	169	169	167	167	170	175	173	172	176
Ballast...............	191	176	175	175	174	175	176	176	176	168	159	146	146	141	139	140	143	143	143	143	153	170	175	175	181
Track Laying, Surfacing..	174	165	188	188	188	188	188	188	188	182	175	164	157	159	165	165	169	167	165	165	178	209	241	252	273
Right-of-way Fences.....	189	177	179	179	176	175	175	175	173	171	164	147	135	140	140	138	143	144	139	139	147	165	179	179	189
Snow, Sand Fences, Sheds	197	194	212	200	201	201	204	204	204	198	188	125	126	140	140	140	155	155	155	155	164	174			
Crossings and Signs......	171	164	178	175	171	169	166	165	165	161	153	131	127	139	137	139	152	145	142	146	163	198			
Station and Office Bldgs..	192	180	194	193	188	184	189	188	187	182	165	141	145	151	151	157	166	166	166	177	188	208	219	227	244
Roadway Buildings......	192	178	196	196	189	187	192	191	190	186	166	140	145	150	150	150	162	162	162	177	186	206	226	237	258
Water Stations..........	185	178	187	187	186	182	185	186	184	177	161	147	151	155	155	156	166	166	166	172	185	195	208	214	227
Fuel Stations...........	181	166	185	185	182	180	183	183	183	174	159	144	149	154	154	153	159	159	159	163	187	205	216	222	242
Shops and Engine Houses.	191	180	193	192	188	185	189	188	187	176	161	137	142	147	147	155	165	165	165	176	188	204	216	223	248
Grain Elevators.........	190	184	197	197	193	190	195	193	193	182	165	137	142	147	147	156	164	164	164	166	200	208	213	217	236
Storage Warehouses.....	193	178	198	198	193	189	193	191	191	184	165	137	142	147	147	154	166	166	166	176	195	207	218	226	253
Wharves and Docks.....	167	158	175	175	174	177	178	178	178	172	158	136	141	146	146	149	153	153	153	161	167	212	226	234	255
Coal and Ore Wharves...	170	159	176	176	174	174	176	176	176	172	157	136	142	147	147	151	153	153	153	160	185	199	211	215	236
Gas Producing Plants....	194	176	188	189	186	185	188	189	189	178	163	145	148	176	176	178	178	177	179	188	198	200	.....	.....	.....
Tel. and Tel. Lines......	191	162	187	179	163	157	163	165	165	150	138	121	119	124	128	131	135	129	129	134	143	156	165	165	173
Signals and Interlockers..	163	158	165	164	162	169	158	155	154	147	138	130	130	133	136	138	143	143	143	146	156	165	176	176	176
Pwr.Dams, Canal, Pipe Lns	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	151	149	149	149	150	181	185	.....	.....	.....
Power Plant Buildings...	197	184	196	196	191	186	191	191	189	177	162	138	143	148	148	152	167	167	167	176	194	204	213	219	246
Power Substation Bldgs..	194	180	197	197	192	188	193	191	190	176	161	137	142	147	147	138	164	164	164	175	187	203	.....	.....	.....
Power Transmission Sys..	145	132	142	136	140	141	137	142	150	136	116	98	98	103	105	108	123	110	110	114	119	121	.....	.....	.....
Power Distribution Sys...	172	163	178	172	175	176	175	178	181	173	148	144	144	148	151	152	155	149	149	155	163	165	.....	.....	.....
Power Line Poles, Fixt's	208	179	209	203	185	183	198	199	209	200	172	147	147	150	153	148	157	152	152	152	173	195	.....	.....	.....
Underground Conduits...	228	214	220	215	220	216	219	219	217	215	175	175	175	180	184	185	185	185	185	185	190	209	.....	.....	.....
Miscellaneous Structures.	192	179	195	195	190	186	191	190	189	182	164	141	146	151	151	154	161	161	161	168	178	183	198	208	229
Paving.................	191	190	191	191	191	190	190	190	190	190	181	156	150	145	145	145	150	150	150	150	171	190	.....	.....	.....
Roadway Machines......	162	149	151	151	151	151	151	149	148	147	144	138	138	147	147	147	161	153	154	158	169	169	187	187	187
Roadway Small Tools....	181	170	173	185	190	190	191	191	190	160	155	155	150	150	150	160	170	180	180	180	190	200	200	200	200
Shop Machinery.........	198	173	183	185	185	186	187	189	191	176	166	155	155	179	179	179	198	200	202	212	224	224	228	236	236
Power Plant Machinery..	198	173	183	185	185	186	187	189	191	176	166	155	155	168	166	171	180	177	180	189	194	194	190	190	191
Power Substa. Apparatus	198	173	183	185	185	186	187	189	191	176	166	155	155	155	150	145	149	151	150	158	160	160	.....	.....	.....



ALBERT KAHN, ARCHITECTS & ENGINEERS, INC

Why Steel Windows?

Every building man knows that steel windows are preferred in 90% of the country's industrial, commercial and institutional buildings. Now a nationwide survey made by independent researchers shows four reasons why:

1. Steel windows provide two psychologically desirable factors—30% more natural sunlight and open spaces permitting workers to see out.
2. Steel windows provide the most economical wall construction.
3. Controlled ventilation is best obtained with steel windows.
4. Steel windows cost less than any other type—are durable and fire resistive.

WHY SPECIFY CECO?

Here are Ceco points of superiority: (1) Tight weather seal, (2) Easy opening and closing . . . no sticking or warping, (3) Beauty of design to enhance the architectural effect, (4) Bonderizing as a standard for protection against rust.

Years of construction experience have given Ceco engineers a sure grasp of all window problems. This fund of knowledge is yours to command in 23 strategically located offices coast to coast. For the latest information on delivery consult your Ceco service headquarters. Ceco catalogs appear in Sweet's Architectural File.

METAL WINDOW INSTITUTE · MEMBER ·

CECO STEEL

CECO STEEL PRODUCTS CORPORATION
GENERAL OFFICES: 5701 West 26th Street, Chicago 50, Illinois
Offices, warehouses and fabricating plants in principal cities

In construction products **CECO ENGINEERING** *makes the big difference*

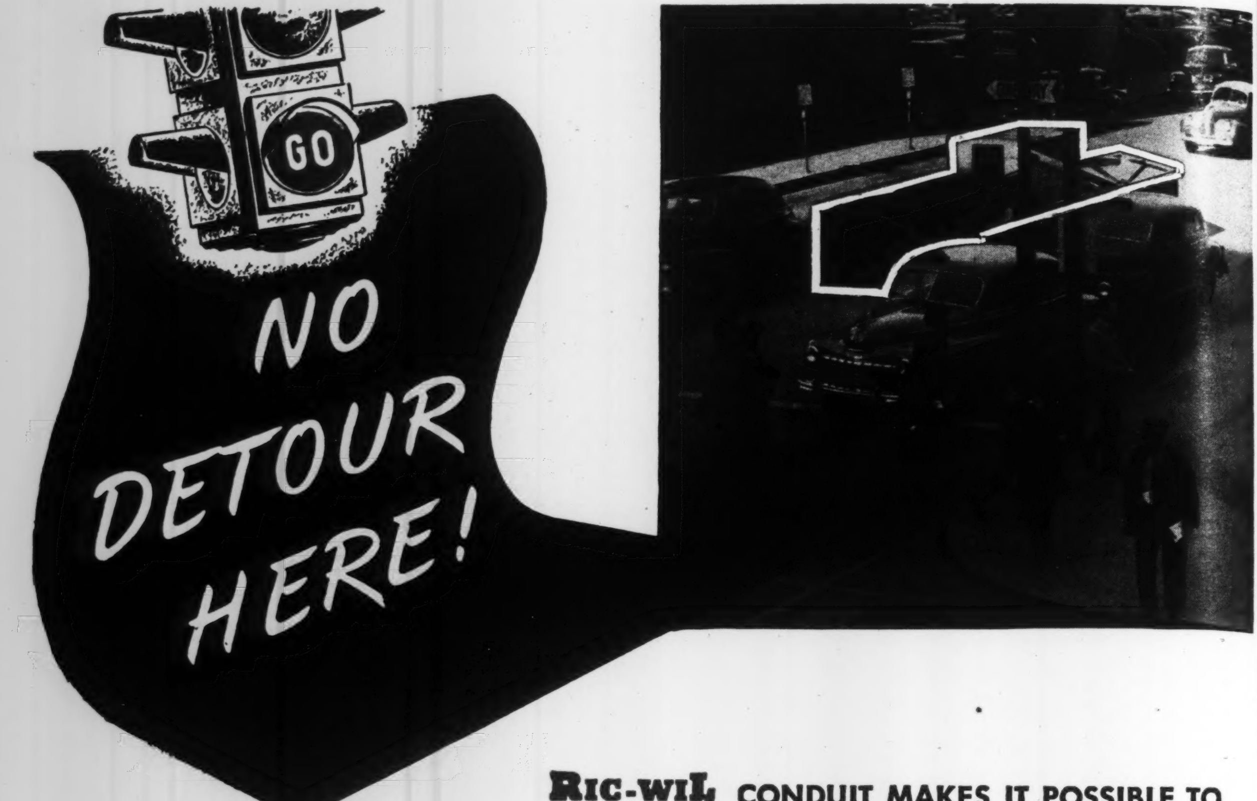
Boeckh Index of Construction Costs—U. S. Average, 1926–'29 = 100

Annual Averages By Cities	Residences		Apartments, Hotels, Office Bldgs. —Brick and—			Commercial & Factory Bldgs.		—Brick and—		
	Frame	Brick	Wood	Conc.	Steel	Frame	Steel	Wood	Steel	Conc.
ATLANTA AREA										
1926–29	82.7	87.0	84.2	83.7	87.0	82.9	94.5	84.7	87.5	86.8
1939	82.8	86.0	86.1	95.1	95.0	80.6	96.2	88.6	94.6	97.4
1940	88.1	90.3	90.6	96.8	97.3	86.3	100.1	91.5	97.3	98.4
1942	102.5	102.8	102.8	104.4	105.1	101.1	106.3	101.4	105.1	104.9
1943	109.8	109.2	109.3	108.5	110.0	110.0	109.0	107.	108.7	108.1
1944	124.5	123.2	123.5	117.3	120.0	126.1	117.2	120.7	118.2	117.2
1945	133.9	132.1	132.5	123.3	127.0	135.9	120.7	130.1	123.3	122.8
1946	149.2	148.1	148.2	136.8	139.9	151.7	130.0	146.8	135.1	136.4
BALTIMORE AREA										
1926–29	107.2	112.0	107.6	100.6	100.7	106.3	95.5	106.8	96.8	101.2
1939	93.5	95.5	95.6	99.3	99.2	94.0	101.7	96.6	101.4	100.2
1940	100.1	101.3	102.0	102.5	103.0	101.0	105.3	102.7	106.1	103.3
1942	115.1	115.0	115.1	113.6	113.9	115.9	112.2	114.4	116.6	114.2
1943	120.8	121.3	121.7	118.9	118.8	122.6	115.6	120.6	120.8	119.4
1944	136.3	134.9	135.3	126.7	12 06	13906	123.4	132.2	129.0	127.5
1945	147.4	145.8	146.0	134.9	137.1	150.9	129.4	141.9	136.4	135.4
1946	163.1	161.7	162.2	149.1	150.8	167.6	138.9	158.8	150.0	148.2
BIRMINGHAM AREA										
1926–29	91.7	96.7	94.1	9505	96.8	90.2	9705	9406	96.3	96.3
1939	87.8	90.9	9105	96.1	96.2	84.9	96.9	95.1	95.6	96.3
1940	91.4	94.0	9405	95.2	96.0	91.4	97.8	97.7	96.5	96.7
1942	108.4	110.8	110.6	110.7	111.0	108.7	107.8	111.3	110.6	112.5
1943	111.6	113.6	11305	113.2	113.6	11203	10905	113.8	112.7	115.0
1944	124.6	115.1	125.2	119.7	121.7	125.5	11406	124.1	119.0	120.9
1945	135.2	135.1	135.7	127.1	124.1	136.2	120.8	133.5	126.2	127.7
1946	149.3	147.4	147.9	137.3	139.4	149.7	128.1	145.4	135.2	137.4
BOSTON AREA										
1926–29	116.3	120.3	115.4	106.2	107.0	118.8	106.3	112.5	108.7	105.8
1939	106.2	110.4	110.1	116.3	113.7	105.7	114.2	111.5	118.2	118.5
1940	111.7	114.7	114.3	116.9	114.9	112.3	114.6	114.6	119.1	119.2
1942	128.4	129.4	129.0	124.3	123.6	131.5	120.1	123.7	126.3	126.3
1943	135.2	135.7	135.2	130.0	129.0	139.0	124.3	130.7	132.0	132.5
1944	145.3	144.2	143.8	136.4	136.4	149.9	132.1	140.1	139.5	139.2
1945	152.5	151.1	150.9	142.1	143.2	157.4	136.7	145.8	144.6	145.0
1946	167.0	166.5	166.0	156.8	156.6	172.1	147.1	161.1	158.5	160.4
CHICAGO AREA										
1926–29	109.2	114.2	109.8	113.2	109.1	112.9	105.2	105.9	112.0	116.0
1939	110.6	112.5	111.1	123.6	118.7	114.2	117.6	109.3	122.6	127.6
1940	117.3	117.8	116.5	124.9	120.9	121.8	118.5	113.4	124.2	128.4
1942	131.7	130.2	128.9	129.7	127.4	137.7	121.4	122.9	129.2	132.2
1943	137.8	136.2	134.8	134.7	132.0	143.9	124.0	128.9	133.7	137.0
1944	146.5	143.6	142.3	139.4	137.4	153.3	130.4	134.8	138.6	142.4
1945	156.6	154.0	152.4	147.8	146.1	163.7	135.7	145.2	146.3	151.3
1946	168.3	166.0	164.2	158.9	156.9	168.1	144.5	157.4	157.0	162.5
CINCINNATI AREA										
1926–29	100.5	105.0	101.3	101.0	100.2	100.2	99.6	103.1	100.6	101.0
1939	103.3	106.2	105.9	113.9	110.4	103.3	111.7	107.1	113.7	116.5
1940	103.9	108.6	107.8	116.0	112.4	105.9	112.3	108.9	114.5	119.2
1942	117.1	118.4	118.1	120.6	118.8	118.5	115.5	116.9	119.9	122.1
1943	122.2	125.0	124.8	124.5	123.6	126.1	118.7	123.8	124.2	126.3
1944	139.1	139.5	139.6	133.0	133.9	141.6	127.2	138.0	134.6	134.7
1945	151.2	152.1	152.1	142.7	142.8	153.1	132.8	151.7	142.9	145.1
1946	165.6	166.8	166.7	154.5	154.7	167.5	140.7	166.4	154.4	156.1
CLEVELAND AREA										
1926–29	107.2	113.4	108.5	111.3	108.3	109.0	103.0	107.2	110.5	114.8
1939	106.2	109.0	109.5	115.3	112.8	107.5	112.9	109.5	117.7	118.0
1940	107.8	111.1	110.9	116.1	113.5	109.2	112.3	110.5	117.9	119.2
1942	123.2	125.3	124.7	127.6	124.8	128.1	119.9	123.1	128.0	130.8
1943	128.6	130.0	129.4	130.3	128.1	131.9	122.0	127.0	130.3	133.2
1944	143.6	143.6	143.0	139.4	138.9	148.5	131.3	138.4	140.6	142.4
1945	154.9	154.7	153.9	148.3	147.3	158.8	136.9	149.6	148.7	151.9
1946	169.2	169.4	168.7	160.2	159.9	174.1	146.4	164.3	161.0	165.9
DALLAS AREA										
1926–29	103.1	107.3	103.2	98.9	99.1	103.6	100.5	100.9	99.4	99.7
1939	95.1	95.8	96.7	98.8	100.2	94.8	106.6	96.0	101.9	98.9
1940	100.7	100.7	101.8	101.1	103.3	100.9	112.8	100.5	106.6	100.6
1942	117.9	115.9	116.8	110.8	114.5	119.7	118.5	111.3	116.8	109.4
1943	126.3	125.5	125.9	123.4	125.6	128.1	123.8	120.9	126.8	125.7
1944	129.2	128.2	128.5	123.6	126.5	131.7	126.8	123.2	126.7	124.4
1945	135.8	134.5	134.9	127.4	131.0	138.2	129.3	130.1	130.8	127.9
1946	150.2	148.8	149.4	139.8	144.4	153.5	140.3	144.6	142.5	141.1
DENVER AREA										
1926–29	95.0	99.7	95.5	102.4	99.6	95.5	105.5	94.6	101.4	108.0
1939	112.1	112.0	111.2	116.1	114.4	114.3	118.7	109.5	117.0	117.8
1940	110.6	111.8	111.3	117.1	115.1	111.9	119.9	111.4	118.4	119.8
1942	121.8	121.8	120.4	122.5	121.9	124.2	125.1	118.7	124.2	124.9
1943	127.8	126.8	126.2	126.2	126.2	131.3	128.3	123.2	128.5	128.2
1944	139.1	137.4	137.3	132.5	134.9	142.5	133.6	133.3	135.4	132.8
1945	147.6	146.7	147.1	141.1	145.2	152.4	145.8	142.2	147.8	144.4
1946	160.1	160.3	160.4	155.3	157.9	164.0	155.6	156.8	160.0	158.3
DETROIT AREA										
1926–29	103.3	108.4	104.3	102.9	102.4	103.7	103.1	103.5	103.3	104.4
1939	98.8	102.7	102.9	108.6	107.5	98.7	108.8	104.2	111.4	110.1
1940	103.3	106.0	106.3	109.2	108.7	103.6	109.7	106.4	111.6	110.6
1942	119.0	120.6	120.5	121.3	119.9	120.3	116.3	119.4	122.5	123.1
1943	126.7	127.9	127.6	126.5	125.4	129.4	120.1	125.9	127.4	128.6
1944	140.0	140.2	140.7	134.5	135.6	143.0	131.0	137.6	138.2	135.7
1945	149.9	149.4	149.7	143.0	144.1	154.3	137.3	145.4	145.8	144.1
1946	165.9	165.9	165.8	157.4	157.9	171.3	147.5	160.9	160.0	159.7
KANSAS CITY AREA										
1926–29	100.3	106.5	102.2	105.7	103.3	101.1	105.9	101.9	107.5	108.8
1939	104.4	109.9	109.8	118.3	115.4	103.8	117.2	113.0	120.0	121.6
1940	109.3	114.3	113.5	119.0	116.7	109.1	117.1	115.5	121.0	122.1
1942	123.1	124.7	125.0	124.6	123.6	124.7	121.7	124.8	127.1	126.5
1943	127.7	128.0	127.9	128.0	127.5	129.7	123.8	128.0	129.9	129.5
1944	138.4	137.6	137.2	133.3	134.7	142.4	134.2	133.2	136.1	134.3
1945	150.6	148.8	148.7	142.7	144.1	156.5	139.6	143.4	145.4	144.4
1946	166.5	165.6	165.4	158.2	159.5	172.3	151.0	159.8	159.3	160.3
LOS ANGELES AREA										
1926–29	92.7	97.9	93.5	98.8	96.8	93.5	97.0	91.3	97.5	103.1
1939	93.6	97.2	97.5	103.7	105.0	95.6	109.5	96.8	106.2	104.9
1940	96.3	97.8	98.3	103.2	105.1	96.1	108.9	97.4	106.4	103.5
1942	119.3	115.6	116.1	116.6	119.4	118.3	123.3	112.4	121.3	116.3
1943	123.7	122.6	122.8	122.6	125.0	127.0	128.8	118.0	127.5	122.8
1944	132.5	131.2	131.1	129.5	132.4	136.6	135.4	125.1	134.4	131.2
1945	139.8	138.3	139.0	134.9	139.4	144.4	140.9	133.3	140.4	135.0
1946	155.1	156.1	156.2	155.3	156.7	160.1	158.3	150.9	160.0	158.7
MINNEAPOLIS AREA										
1926–29	92.8	98.2	94.6	95.6	96.1	92.8	100.0	93.9	97.9	98.4
1939	101.9	105.0	104.2	113.5	110.7	102.7	113.4	103.6	114.5	117.2
1940	106.1	108.2	107.5	113.6	111.7	107.8	113.8	105.4	115.3	117.2
1942	121.2	121.4	120.6	120.5	120.9	124.5	118.9	116.8	122.7	124.2
1943	126.0	125.4	124.6	123.2	122.9	130.5	121.1	120.0	125.5	126.3
1944	137.7	136.2	135.8	129.8	131.0	142.8	127.5	130.3	132.9	132.5
1945	149.8	150.9	150.8	141.1	141.2	152.2	132.4	149.4	142.6	143.5
1946	163.7	167.6	167.5	156.5	155.7	164.9	142.6	168.2	157.2	159.5
NEW ORLEANS AREA										
1926–29	93.3	96.3	93.4	86.5	90.6	93.3	93.7	91.5	89.5	86.5
1939	89.0	90.3	91.3	95.4	98.3	88.1	102.8	91.7	98.5	94.9
1940	97.3	97.4	98.1	100.3	102.2	97.3	104.7	97.9	101.6	99.2
1942	110.6	109.9	110.3	110.7	113.0	114.0	118.0	108.0	114.6	111.2
1943	113.1	113.1	113.4	113.4	116.0	117.0	120.0	110.6	117.3	114.0
1944	124.6	122.3	122.6	117.7	122.7	128.5	124.6	117.7	122.1	117.1
1945	136.4	134.4	134.5	127.7	131.6	139.1	131.1	130.5	131.6	128.4
1946	148.9	147.4	148.2	138.6	142.8	151.2	138.7	145.4	142.0	138.7
PHILADELPHIA AREA										
1926–29	100.3	106.3	103.7	105.9	103.1	98.1	101.9	104.2	104.1	107.5
1939	99.2	102.6	102.9	105.7	104.1	98.2	102.0	105.0	105.5	106.7
1940	103.0	105.4	106.0	106.7	106.1	102.1	105.9	107.4	107.9	107.5
1942	121.8	123.5	123.6	123.1	122.0	122.7	116.6	123.0	123.2	125.1
1943	127.6	129.0	129.2	127.2	126.7	128.6	119.6	127.4	127.1	127.5
1944	142.8	142.1	142.4	135.6	135.9	145.0	127.6	139.0	135.2	136.5
1945	152.1	151.1	151.9	141.9	143.7	155.3	131.8	147.8	141.3	142.7
1946	165.0	163.9	164.9	153.2	154.6	169.0	141.2	161.1	152.7	154.0
NEW YORK CITY AREA										
1926–29	133.3	138.4	131.9	122.8	120.4	137.5	113.1	127.4	123.2	125.3
1939	122.1	123.3	122.5	130.6	125.9	125.6	123.7	119.6	130.0	133.3
1940	124.6	125.7	125.1	132.0	127.4	128.0	124.3	122.2	131.2	134.9
1942	140.7	139.1	138.2	137.9	135.6	145.0	128.5	132.6	137.1	139.3
1943	144.5	142.5	141.6	140.2	138.0	150.0	130.3	135.8	139.0	141.7
1944	154.3	153.1	152.7	149.6	147.7	159.8	139.8	147.2	149.6	152.6
1945	161.7	160.5	160.1	156.3	155.9	167.2	144.2	155.0	155.4	158.0
1946	182.4	181.8	181.1	177.2	174.6	188.1	158.6	177.4	174.8	179.0
PITTSBURGH AREA										
1926–29	113.2	118.8	112.8	111.2	107.1	115.4	89.6	112.2	104.6	112.9
1939	113.8	117.0	115.7	117.5	114.2	114.2	109.8	116.5	116.9	119.1
1940	115.0	117.3	116.7	117.7	114.4	115.6	109.5	117.4	116.2	119.3
1942	132.7	131.1	130.6	126.0	124.4	133.9	115.4	128.6	124.8	127.6
1943	139.0	137.8	136.9	131.6	129.8	142.9	119.0	133.9	129.6	131.9
1944	149.1	147.3	146.4	138.3	137.0	153.3	125.4	142.6	136.6	139.3
1945	157.6	159.9	155.9	146.1	145.0	161.4	130.3	153.2	143.7	148.0
1946	169.5	169.0	168.0	156.6	155.3	173.5	140.1	166.4	153.2	158.9
ST. LOUIS AREA										
1926–29	118.6	121.1	115.7	109.9	108.8	121.8	103.3	111.7	107.7	109.3
1939	107.0	110.2	109.9	118.7	116.4	107.6	114.3	110.3	119.2	119.8
1940	109.2	111.9	111.6	119.2	117.0	109.9	113.4	111.6	119.2	120.3
1942	123.3	124.5	124.1	126.9	125.9	126.3	120.9	122.3	126.9	128.6
1943	126.4	128.2	128.1	131.2	129.4	129.3	123.4	126.5	130.3	133.3
1944	138.4	138.4	138.3	135.7	136.3	142.1	129.8	136.4	136.6	136.7
1945	152.3	152.8	151.4	146.2	146.4	156.2	135.9	148.1	145.6	148.5
1946	167.4	167.1	166.2	159.1	158.9	171.7	145.3	154.8	158.1	161.1
SAN FRANCISCO AREA										
1926–29	87.7	93.7	90.4	97.5	96.5	86.1	95.5	95.5	91.8	99.0
1939	99.2	105.7	104.5	117.4	114.4	97.6	114.9	107.4	116.5	121.9
1940	100.7	106.0	106.0	116.4	114.1	99.6	112.2	108.1	115.7	120.4
1942	120.1	123.6	123.4	127.5	127.5	121.1	127.2	123.7	130.8	129.3
1943	127.7	131.3	131.4	133.2	133.2	128.8	131.9	131.5	136.3	136.6
1944	137.1	139.4	139.5	139.4	139.7	139.0	137.1	138.4	142.4	142.8
1945	144.3	146.2	146.8	144.5	146.1	147.2	141.9	145.3	147.9	146.8
1946	157.5	159.7	160.0	157.9	159.0	160.5	151.5	158.4	160.0	159.3
SEATTLE AREA										
1926–29	84.5	92.2	89.2	101.7	95.1	82.4	100.8	92.2	100.5	105.3
1939	96.7	104.4	103.8	119.2	114.9	94.4	115.1	108.3	118.7	125.9
1940	99.0	106.2	105.5	119.1	115.1	97.2	112.8	109.4	117.7	124.2
1942	121.5	122.7	122.3	131.7	128.6	116.5	129.2	124.2	133.4	136.0
1943	125.4	129.7	129.2	136.6	134.1	124.4	133.7	130.8	138.9	142.1
1944	135.0	139.3	138.7	144.6	142.3	135.7	140.9	139.0	147.2	149.1
1945	143.7	148.6	148.2	151.7	150.5	143.6	147.0	148.7	154.5	156.8
1946	152.9	158.3	157.9	161.2	159.8	154.3	156.0	158.9	164.2	167.1
WASHINGTON, D. C.										
1926–29	106.6	107.7	107.9	107.1	105.9	106.0	104.0	108.0	106.4	108.4
1945	153.4	150.3	151.9	144.4	145.9	157.8	135.9	146.5	144.6	143.5
1946	168.5	166.2	167.1	157.1	158.2	173.6	145.2	162.6	157.2	156.6

Reproduced by permission of E. H. Boeckh & Associates, Inc., Consulting Valuation Engineers, Cincinnati, Ohio.

See page 92, Apr. 27, 1939 issue for 1913-1938 data of series for Atlanta, New York, St. Louis and San Francisco.

Current indexes are calculated upon an actual survey at source of local construction cost conditions. Material prices used are those paid by contractors to material dealers. Labor rates are current rates paid by contractors—certain corrections being made in certain areas for labor efficiency and labor shortage. Index includes construction overhead, sales taxes, compensation insurance and social security. The indexes have been primarily engineered to use as local cost conversion factors to construction cost data released by the Boeckh organization. Complete index formula is available in published form in "Boeckh's Index Calculator Tables".



RIC-WIL CONDUIT MAKES IT POSSIBLE TO INSTALL STEAM LINE UNDER BUSY STREET — WHILE TRAFFIC MOVES AS USUAL

Special flanged prefabricated units 10′ 6″ long, arranged for lateral expansion, installed in tunnel.

● Ric-wiL prefabricated insulated units enabled the Toledo Edison Co. to carry out a truly modern method of installing underground pipe, without the necessity of tearing up street pavement from curb to curb. Instead of the tremendous expense and crippling confusion which are often involved in such projects, traffic proceeded normally on busy Jefferson St., almost completely unaware of the work in progress below. From a 6 ft. square excavation at the steam main, crews augered 26″ x 36″ tunnels both ways, welded Ric-wiL pre-sealed units together and jacked them through to building basements. This is a graphic demonstration of one of the many reasons why the words "Ric-wiL Prefabricated Conduit" appear with such constant regularity on engineering specifications sheets.

Write for descriptive Catalog No. 44.

RIC-WIL INSULATED PIPE CONDUIT SYSTEMS
THE RIC-WIL COMPANY • CLEVELAND, OHIO
AGENTS IN PRINCIPAL CITIES

Public Utility Construction Cost Index

Compiled and published by Whitman, Requardt and Associates, and B. L. Smith & Associates, Baltimore, Md., for the Estate of William W. Handy

Table No. 1 Cost Trends of Building Construction, 1911 to 1914 = 100

(Complete Index reports 13 items entering into Building Construction Costs.) A relates to Reinforced Concrete Bldg.; B relates to Brick Bldg.

		Jan. 1921	Sept 1921	Feb. 1922	Jan. 1923	Jan. 1924	July 1924	Jan. 1925	July 1925	Jan. 1926	July 1926	Jan. 1927	July 1927	Jan. 1928	July 1928	Jan. 1929	July 1929	Jan. 1930	July 1930	Jan. 1931	July 1931	Jan. 1932	July 1932	Jan. 1933	July 1933	Jan. 1934	July 1934	Jan. 1935	July 1935	Jan. 1936	July 1936	Jan. 1937	July 1937	Jan. 1938	July 1938	Jan. 1939	July 1939	Jan. 1940	July 1940	Jan. 1941	July 1941	Jan. 1942	July 1942	Jan. 1943	July 1943	Jan. 1944	July 1944	Jan. 1945	July 1945	Jan. 1946	July 1946	Jan. 1947
Atlantic Seaboard Division	A	233	182	165	199	227	224	221	216	213	213	214	203	204	206	209	212	205	194	189	179	171	159	153	165	178	194	191	189	191	192	199	216	214	205	205	207	210	209	220	235	250	253	254	254	256	258	259	260	271	304	336
	B	245	207	188	215	237	232	230	229	228	229	230	223	224	217	219	220	212	207	203	194	189	173	166	175	189	200	195	194	197	197	203	218	217	211	211	214	217	216	224	235	246	250	251	252	254	255	262	265	276	308	329
North Central Division	A	228	181	163	193	219	214	212	208	203	201	205	194	195	197	200	203	199	190	185	177	169	154	151	162	175	186	182	182	186	187	196	209	209	200	200	200	202	201	210	225	237	242	243	243	246	248	249	253	256	291	326
	B	238	201	181	206	225	218	216	215	212	211	214	208	209	201	203	205	199	195	192	186	181	164	161	170	183	190	185	184	188	189	197	207	208	203	203	203	205	204	210	220	229	234	235	235	240	241	248	250	259	284	310
South Central Division	A	229	181	160	191	213	206	203	196	192	191	194	186	186	188	191	193	187	179	176	159	149	144	140	148	160	173	179	173	175	177	187	200	198	188	188	187	189	190	199	216	232	236	237	235	237	241	242	243	249	279	318
	B	240	224	181	206	221	211	208	205	203	204	205	201	202	195	197	198	190	185	183	168	160	154	151	157	171	179	182	175	178	180	186	198	197	191	191	191	193	194	200	212	223	227	230	229	230	234	235	238	244	272	399
Plateau Division	A	221	181	164	192	215	208	208	201	198	197	199	188	189	191	194	196	190	180	177	166	153	149	146	156	168	178	174	172	176	180	188	206	203	194	194	194	197	196	205	218	230	235	235	233	237	237	238	239	248	278	307
	B	232	203	185	207	223	214	214	211	211	210	211	205	205	199	200	201	193	187	184	175	167	163	160	168	182	187	182	181	182	185	191	206	204	199	199	200	201	201	206	214	221	227	229	227	229	230	231	233	257	286	309
Pacific Division	A	226	187	165	191	212	205	203	196	191	190	196	185	185	188	191	194	188	178	175	165	157	148	145	153	166	177	174	173	175	178	186	200	199	192	192	192	194	192	201	217	238	241	243	242	243	245	248	248	251	294	328
	B	234	207	185	204	217	206	205	201	198	197	203	197	197	190	192	194	186	180	177	169	164	156	154	156	170	177	172	173	176	179	185	198	197	193	193	193	195	194	199	210	226	231	234	234	236	237	241	242	245	279	303

Table No. 2 Cost Trends of Gas Plant Construction, 1911 = 100

(Complete Index reports 17 items entering into Gas Plant Construction Costs) A relates to Total Constr. & Equip.; B relates to Mech. Equip. Exclusive of Gas Holders

		July 1920	Jan. 1921	Sept 1921	Jan. 1923	Jan. 1924	July 1924	Jan. 1925	July 1925	Jan. 1926	July 1926	Jan. 1927	July 1927	Jan. 1928	July 1928	Jan. 1929	July 1929	Jan. 1930	July 1930	Jan. 1931	July 1931	Jan. 1932	July 1932	Jan. 1933	July 1933	Jan. 1934	July 1934	Jan. 1935	July 1935	Jan. 1936	July 1936	Jan. 1937	July 1937	Jan. 1938	July 1938	Jan. 1939	July 1939	Jan. 1940	July 1940	Jan. 1941	July 1941	Jan. 1942	July 1942	Jan. 1943	July 1943	Jan. 1944	July 1944	Jan. 1945	July 1945	Jan. 1946	July 1946	Jan. 1947
Atlantic Seaboard Division	A	279	265	205	224	241	238	234	229	230	230	226	223	215	216	216	219	218	216	214	208	202	188	176	178	189	216	216	217	218	218	225	246	246	244	241	249	253	253	257	264	272	275	276	279	279	279	283	288	302	334	366
	B	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297	299	299	298	298	296	296	301	301	369	387
North Central Division	A	257	248	201	206	226	224	220	217	217	218	214	211	204	205	204	206	207	208	207	203	198	178	182	185	196	203	202	203	208	208	219	235	237	235	232	232	236	236	238	245	249	254	258	261	262	261	264	269	272	308	335
	B	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297	299	299	298	298	296	296	301	301	369	387
South Central Division	A	251	246	203	196	214	210	205	199	199	200	198	195	187	187	187	190	188	187	185	177	171	160	158	167	177	184	195	196	202	202	208	223	222	219	216	217	220	220	223	236	244	249	254	255	255	256	258	261	266	298	335
	B	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297	299	299	298	298	296	296	301	301	369	387
Plateau Division	A	234	231	194	193	210	206	206	201	202	202	198	195	187	189	189	191	189	188	186	181	176	166	170	173	184	191	190	190	195	195	202	221	221	220	216	217	220	220	223	228	232	237	238	238	239	239	240	243	255	290	313
	B	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297	299	299	298	298	296	296	301	301	369	387
Pacific Division	A	255	248	212	203	219	215	211	206	205	206	206	203	196	197	197	201	200	198	197	191	187	177	180	178	189	196	195	197	198	203	210	228	228	230	227	228	232	231	235	244	253	257	258	261	262	263	264	266	271	315	342
	B	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297	299	299	298	298	296	296	301	301	369	387

Table No. 3 Cost Trends of Electric Light and Power Construction, 1911 = 100

(Complete Index reports 50 items entering into Electric Light and Power Construction Costs) A relates to Total Constr. & Equip.; B to Electr. Plant — Steam; C to Sub-Sta. Equip.

		Jan. 1921	Sept 1921	Jan. 1923	Jan. 1924	July 1924	Jan. 1925	July 1925	Jan. 1926	July 1926	Jan. 1927	July 1927	Jan. 1928	July 1928	Jan. 1929	July 1929	Jan. 1930	July 1930	Jan. 1931	July 1931	Jan. 1932	July 1932	Jan. 1933	July 1933	Jan. 1934	July 1934	Jan. 1935	July 1935	Jan. 1936	July 1936	Jan. 1937	July 1937	Jan. 1938	July 1938	Jan. 1939	July 1939	Jan. 1940	July 1940	Jan. 1941	July 1941	Jan. 1942	July 1942	Jan. 1943	July 1943	Jan. 1944	July 1944	Jan. 1945	July 1945	Jan. 1946	July 1946	Jan. 1947
Atlantic Seaboard Division	A	221	183	189	201	196	201	197	197	194	193	187	192	192	195	206	204	188	191	188	182	176	170	177	186	200	200	199	204	205	213	230	226	222	224	225	232	231	233	242	248	248	250	252	251	249	251	259	266	303	327
	B	216	194	186	195	192	199	196	197	196	194	190	193	192	200	208	206	198	198	195	192	186	182	186	200	205	205	204	205	209	210	229	226	223	225	224	235	234	234	236	241	239	242	242	241	226	226	237	248	278	308
	C	201	182	176	187	186	191	190	184	178	176	172	173	173	170	181	179	174	177	175	172	168	165	166	172	184	184	184	185	187	188	204	204	203	203	203	212	212	212	213	217	216	216	216	216	207	207	218	228	252	273
North Central Division	A	210	176	179	193	189	194	192	190	187	187	182	186	186	189	199	199	184	188	187	186	174	172	179	187	195	195	194	199	199	209	224	222	216	219	218	222	221	222	232	235	238	238	239	239	237	238	243	245	280	299
	B	197	179	171	185	185	189	189	189	188	188	185	188	187	195	202	203	195	197	199	199	186	186	189	203	204	203	202	204	205	209	227	225	222	224	223	225	224	224	229	229	231	231	231	230	216	216	218	222	249	272
	C	184	167	162	178	179	182	184	178	171	171	168	169	169	167	177	176	172	177	179	181	169	169	171	176	184	184	184	184	184	187	204	203	202	203	202	203	203	203	206	207	209	207	207	207	198	198	200	204	225	240
South Central Division	A	216	183	182	193	186	189	186	184	183	182	179	183	186	189	199	197	185	186	183	179	171	169	179	187	195	198	193	199	201	208	224	221	216	218	218	223	224	227	239	245	246	247	247	248	247	248	251	251	288	310
	B	210	188	181	190	186	189	186	187	189	187	186	189	195	202	210	209	205	204	203	200	190	189	198	211	212	212	203	208	212	214	234	232	229	231	230	235	237	240	246	250	248	248	248	250	235	235	235	235	267	290
	C	195	176	172	182	181	181	181	175	171	170	169	170	176	174	184	182	182	184	183	181	173	173	179	185	192	192	184	188	191	192	211	210	209	210	209	213	216	219	223	226	226	224	224	226	217	217	217	217	243	257
Plateau Division	A	209	178	179	192	186	191	191	190	188	186	181	185	185	188	198	197	181	183	181	177	171	169	179	188	196	196	195	198	198	206	225	221	216	218	219	223	222	223	232	234	236	236	236	235	233	238	241	244	282	300
	B	202	186	178	191	189	191	194	197	196	194	190	193	193	200	208	207	199	198	197	194	188	188	197	211	212	211	210	210	210	212	234	232	229	231	232	235	234	234	236	237	236	235	235	234	219	225	225	225	259	279
	C	187	173	168	184	183	184	188	185	177	176	172	173	173	171	182	179	175	177	177	175	171	171	177	183	191	191	191	189	189	189	210	209	208	209	211	212	212	212	212	213	212	210	210	210	201	207	207	207	234	246
Pacific Division	A	214	185	178	187	182	185	182	180	178	181	175	180	179	182	192	191	176	178	175	172	163	161	107	178	189	189	192	196	197	204	221	218	214	216	215	219	218	219	231	235	242	242	243	245	241	242	244	244	283	300
	B	206	191	172	180	178	180	178	178	177	182	178	181	180	187	195	193	186	186	185	182	170	170	178	191	198	197	203	204	204	206	226	223	221	222	222	223	223	223	231	231	240	240	240	239	225	225	225	225	256	275
	C	193	180	163	174	173	174	173	167	161	165	162	163	163	161	171	168	165	167	166	164	155	155	161	166	179	179	184	185	185	186	204	203	202	203	202	203	203	203	209	210	219	217	217	216	208	208	208	208	234	244

SHIPSHAPE and

Dependable...

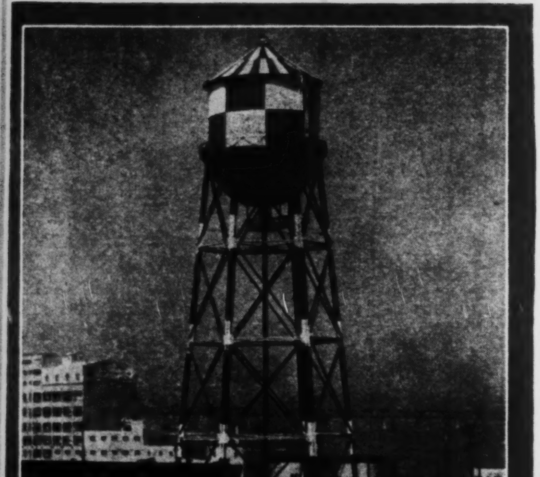
TYPICAL OF THE
MANY U. S. NAVY
ELEVATED TANK
INSTALLATIONS

by

PITTSBURGH · DES MOINE

Builders of Elevated Steel Tank for Better Water Storage sinc

1897



These sturdy Elevated Steel Tanks, built by Pittsburgh-Des Moin to Navy specifications, are representative of hundreds of simil installations erected by us for the armed services. Above a shown the 250,000-gallon and 200,000-gallon P-DM tanks bu at Alameda Naval Air Station (the wireless towers are ours, too and at left, the 200,000-gallon tank erected at the Oakland Nav Supply Depot.

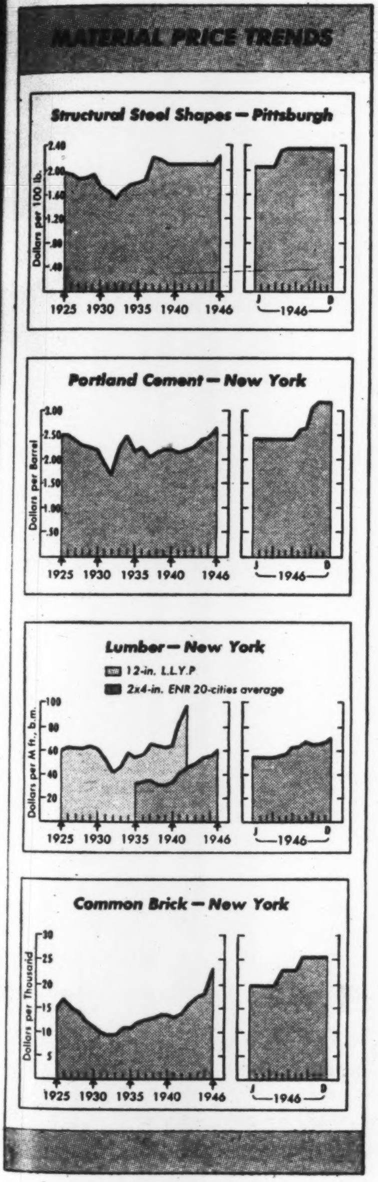
As specialists in modern elevated steel tank design and co struction, we invite your inquiries and will gladly arrange f consultation.

PITTSBURGH · DES MOINE
STEEL COMPANY

PITTSBURGH, PA., 3414 NEVILLE ISLAND—DES MOINES, IOWA, 915 TUTTLE STREET
NEW YORK, ROOM 916, 270 BROADWAY · CHICAGO, 1218 FIRST NATIONAL BANK BLDG. · DALLAS, 1
PRAETORIAN BUILDING · SAN FRANCISCO, 621 RIALTO BUILDING · SEATTLE, 522 FIRST AVENUE, SO

Prices of Construction Materials

CONSTRUCTION MATERIAL PRICES rose 12 percent in 1946 according to the Bureau of Labor Statistics combined index of building materials. More than half of this rise occurred during the months of November and December, after removal of OPA price controls. Lumber prices contributed most to this increase by gaining 15 percent over 1945 prices. Structural steel prices remained constant from 1939 through 1945, but gained 10 percent over the 1945 average. Other gains ranged from 5 to 13 percent.



Basic Building Materials Prices—New York City

Average yearly prices at New York, except in the case of steel, which is f. o. b. Pittsburgh mill; wrought, iron I beams for years 1879, 1885 and 1886. Brick, wholesale, f. o. b. Lime, common lump, wholesale, f. o. b., 180 lb., net, 1910–15, incl.; afterward, 280 lb. Cement, net, delivered; *Rosendale, 1874 to 1878 incl.;* afterward, Portland. Lumber, No. 1 com., rough, wholesale, at dock, for 1 in., yel. pine, 1874 to 1909, incl.; afterward, 3 in., long-leaf to 1913, incl. *LLYP–3 x 12 — from Lumber Trade Journal. †LLYP–12 x 12 as reported to Engineering News-Record. Cast iron pipe price per ton f. o. b. Delaware River foundries; *prices prior to 1901 are for all classes of bell and spigot;* prices subsequent to 1901 are for 6 in. and larger Cl. B or heavier bell and spigot; early prices from "Price History of Cast Iron Pipe" by United States Cast Iron Pipe and Foundry Co.; prices 1850, $35.72; 1855, $40.18; 1860, $32.15; 1865, $58.05; 1870, $50.

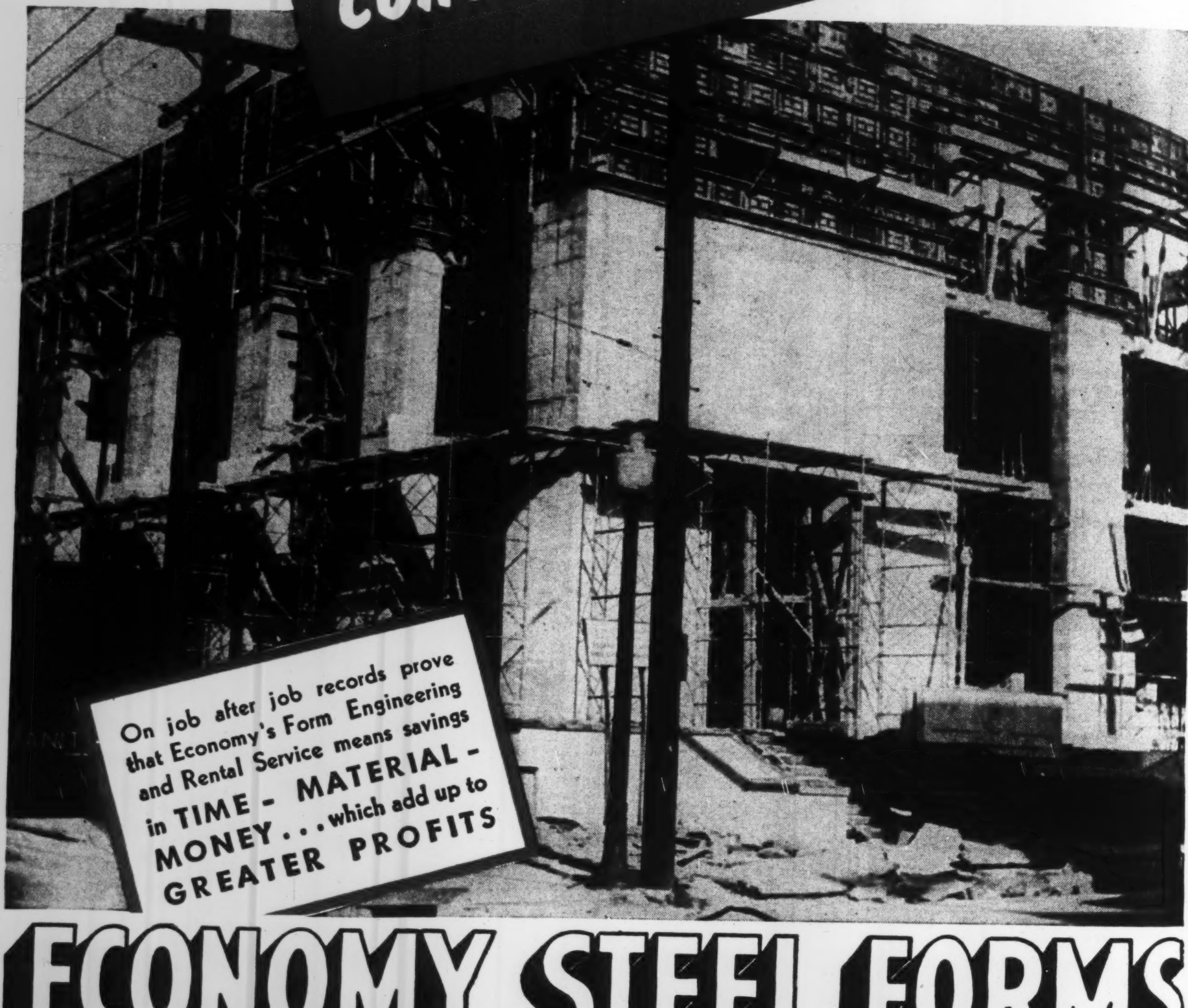
	Brick Common per M	Cement Per Bbl.	Lime Per Bbl.	Pine per M. Ft. b.m.		Steel Shapes, Per 100 Lb.	Cast Iron Pipe, Per Ton
1874	$7.41	*$1.48*	$1.50	$26.00		....	*$43.76*
1875	7.12	*1.25*	1.40	21.00		....	*37.51*
1876	5.87	*1.20*	1.00	21.00		....	*31.26*
1877	4.93	*1.10*	.80	20.00		....	*25.00*
1878	4.71	*.95*	.70	20.00		....	*23.22*
1879	4.08	2.70	.80	20.96		$2.78	*29.47*
1880	7.00	2.88	.87	19.00		....	*29.47*
1881	7.50	2.72	.95	19.00		....	*33.04*
1882	7.12	2.82	1.01	19.00		....	*35.68*
1883	8.28	2.75	1.05	19.00		....	*32.15*
1884	6.65	2.60	.95	19.00		....	*26.79*
1885	6.10	2.28	1.00	18.66		3.12	*25.00*
1886	7.51	2.28	1.00	19.00		3.00	*26.79*
1887	7.43	2.07	.82	19.00		....	*28.58*
1888	6.50	2.16	.83	16.75		....	*25.00*
1889	7.06	2.23	.92	20.31		....	*23.04*
1890	6.65	2.25	.95	21.75		....	*24.65*
1891	5.53	2.38	.87	18.00		....	*23.04*
1892	5.77	2.27	.93	18.50		....	*21.43*
1893	5.83	2.15	.93	18.50		....	*21.30*
1894	5.00	2.03	.85	18.50		1.20	*18.47*
1895	5.31	1.97	.78	16.92		1.35	*17.95*
1896	5.06	2.00	.69	16.42		1.60	*17.64*
1897	4.94	1.97	.72	16.44		1.24	*15.48*
1898	5.75	2.00	.70	15.75		1.27½	*15.48*
1899	5.69	2.05	.75	16.25		1.45	*21.17*
1900	5.25	2.16	.68	24.50		1.95	*22.33*
1901	5.77	1.89	.77	17.50		1.60	*21.63*
1902	5.39	1.95	.81	21.00		1.60	26.62
1903	5.91	2.03	.79	23.50		1.70	27.56
1904	7.50	1.67½	.80	21.50		1.60	22.92
1905	8.10	1.43	.89	24.92		1.62	26.54
1906	8.55	1.55	.95	29.33		1.60	30.12
1907	6.16	1.55	.95	30.50		1.75	31.52
1908	5.10	1.46	1.05	30.50		1.76	24.69
1909	6.39	1.41	1.05	33.04		1.50	24.19
1910	5.70	1.07	.75	24.00		1.46	22.99
1911	5.31	1.04	.75	24.63		1.36	19.99
1912	6.75	.97	.75	24.02		1.33	21.22
1913	6.75	1.18	.91½	* 25.04	†	1.50	21.96
1914	5.50	1.17½	.97	21.79	29.25	1.16	20.37
1915	5.50	1.00	.97	21.68	27.91	1.28	22.52
1916	8.00	1.32	1.50	27.60	31.58	2.45	30.25
1917	9.10	1.76	2.02	38.00	37.81	3.62	52.33
1918	10.98	2.48	2.16	46.68	43.33	3.00	58.68
1919	15.79	2.63	2.65	57.04	49.60	2.52	53.87
1920	18.00	3.52	3.15	71.17	66.50	2.45	71.77
1921	17.40	2.82	3.47	50.67	51.54	2.00	50.58
1922	16.91	2.43	2.79	49.41	51.83	1.70	46.42
1923	20.00	2.66	2.98	61.77	62.25	2.39	57.75
1924	18.00	2.50	2.88	55.17	59.00	2.19	54.33
1925	15.00	2.50	2.38	57.00	59.67	1.95	49.16
1926	17.00	2.50	2.18	60.33	62.17	1.93	48.50
1927	15.00	2.40	2.49	62.57	61.46	1.86	41.42
1928	14.00	2.30	2.30	63.33	61.34	1.87	35.92
1929	11.71	2.23	2.25	64.50	63.00	1.92	36.66
1930	10.88	2.19	2.25	64.33	60.64	1.71	37.00
1931	10.29	1.89	2.25	58.17	53.02	1.63	34.71
1932	9.75	1.62	2.25	39.91	41.33	1.56	30.58
1933	9.50	2.26	2.50	46.25	46.79	1.64	34.58
1934	10.87	2.48	2.50	57.17	58.92	1.78	41.00
1935	11.00	2.15	2.35	51.67	53.75	1.80	42.58
1936	12.00	2.26	2.80	56.75	57.75	1.84	43.00
1937	12.50	2.07	2.80	61.50	66.46	2.21	48.75
1938	13.10	2.12	2.80	59.33	62.75	2.18	48.33
1939	13.46	2.20	2.80	64.35	62.50	2.10	46.75
1940	13.50	2.20	2.68*b*	67.39	65.46	2.10	49.00
1941	13.13	2.15	2.66*b*	75.50	83.33	2.10	49.00
1942	14.17	2.20	2.80*b*	85.61	98.33	2.10	49.00
1943	15.88	2.27	2.80*b*	88.81	......	2.10	49.00
1944	17.46	2.42	2.80*b*	89.92	......	2.10	49.00
1945	18.33	2.45	2.80*b*	89.92	......	2.10	50.00
1946	23.04	2.71	17.91*a*	93.58*c*	......	2.29	60.08

a Pulverized masons, del., per ton. Bbls. not available in 1946. *b* Price corresponding to 1946 unchanged at $17.00 per ton from Sept., 1940 through Aug., 1946. *c* 3 x 12 Rgh. SLYP. LLYP. not available.

Index Numbers of Wholesale Prices—Bureau of Labor Statistics

(1926 = 100)	1946	1945	1944	1943	1942	1941	9140	1939	1938	1937	1936
BUILDING MATERIALS	132.2	117.7	115.5	111.4	110.2	103.2	94.8	90.5	90.3	95.2	86.7
Brick and tile	123.0	112.3	161.7	99.1	98.0	93.7	90.5	91.4	91.0	93.5	88.7
Cement	104.1	99.4	95.8	93.8	94.0	92.0	90.8	91.3	90.3	89.0	92.2
Lumber	178.1	154.9	152.7	141.3	133.0	122.5	102 9	93.2	87.4	99.7	87.0
Paint and paint mat.	118.3	106.8	105.2	102.3	100.3	91.4	85 7	82.8	81.3	83.4	80.1
Plumbing and heating	103.5	93.4	92.2	90.7	95.4	84.8	80.4	79.2	78.5	78.8	75.0
Structural steel	118.5	107.3	107.3	107.3	107.3	107.3	107.3	107.3	111.0	113.2	95.0
Other building mat.	117.9	104.3	103.1	102.0	103.5	98.3	93.3	90.3	92.7	99.1	90.2

FOR RENT . . .
STEEL FORMS FOR
CONCRETE CONSTRUCTION



On job after job records prove that Economy's Form Engineering and Rental Service means savings in TIME - MATERIAL - MONEY . . . which add up to GREATER PROFITS

ECONOMY STEEL FORMS

A nation-wide form-rental and engineering service that saves costly material and time in concrete construction. We welcome job inquiries by letter, wire or telephone

ECONOMY FORMS CORP. . . . Home Office: Des Moines, Iowa
District Offices: • Fort Wayne, Ind. • Plainfield, N. J. • Atlanta, Ga. • [illegible]

December, 1946

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

There have been scattered increases since removal of OPA price controls. More widespread increases are expected next month. LUMBER rose $3.886 per M ft. B.M., according to the ENR 20-cities average. Birmingham showed the greatest rise with an increase of $34.50 for 2x4 Southern Pine. Other increases were $8 in Detroit, $4 in Pittsburgh, and $1.50 in Baltimore. 2x4 Douglas Fir rose $10 in San Francisco, $3.30 in Pittsburgh, and $1.50 in Baltimore. RED LEAD rose $3.50 in all cities, and WHITE LEAD rose $8.

ALUMINUM PAINT rose $.30 per gal. in Birmingham, $.66 in Denver, $.40 in Los Angeles, and $.09 in Seattle. ASPHALTIC FELT ROOFING rose $.07 per 100 lb. in Birmingham, $.15 in Los Angeles, $.1997 in New York, and $.07 in Seattle. LIME, hydrated finishing, rose $3.20 per ton in Minneapolis, $3.60 in New York, $1.00 in San Francisco, and $7.95 in Seattle. WAGE RATES remained fairly constant, the skilled average increasing only $.008 per hour, and the common average, $.007. In Cleveland, however, all construction wages increased $.125.

CEMENT, AGGREGATE, READY-MIXED CONCRETE—F. O. B. CITY

	PORTLAND CEMENT Per bbl. C/L lots incl. $1.00 per bbl. for bags, cash dis. not deducted			SAND AND GRAVEL Per ton, carload lots			CRUSHED STONE Per ton, carload lots		CRUSHED SLAG Per ton, carload lots, f.o.b. plant		CONCRETE BLOCK 8x8x16-in.; truckload del.; per block		CONCRETE Ready Mixed 1:2:4, over 50 c.y., del.
	Cloth	Paper	Bulk	Gravel 1½ in.	Gravel ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	Sand-grav.	Lt.wgt.Agg.	
Atlanta	$2.77*a*	$2.52	$2.43	$1.79	$1.89	$1.65	$1.79	$1.89	$1.59	$1.69	$0.17	....	$9.00
Baltimore	2.70*a*	2.45*a*	2.20*a*	2.05‡	2.05‡	1.55‡	2.00‡	2.00‡	2.00‡	2.00‡	.145	$0.145*w*	8.00
Birmingham	2.70*a*	2.45	....	2.00	2.00	1.59	2.50	2.50	.90	1.15	.1425	....	6.90
Boston	3.70*b*	2.85*b*	2.60	1.50‡	1.50‡	1.40‡	1.25	1.35	....	....	.13	.155*w*	7.90*m*
Chicago	3.60	2.75	2.56	2.45‡*d*	2.45‡*d*	2.50‡*d*	2.45‡*d*	2.45‡*d*	1.75‡	1.75‡	.195	.195*x*	....
Cincinnati	2.59*a*	2.34	2.14	1.20	1.20	1.10	1.80	1.80	....	....	.15	.18*w*	7.45
Cleveland	3.28	2.43	2.18	1.75*i*	1.75*i*	1.40/2.05*i*	1.50*i*	1.50*i*	1.23	1.23	.19	.19	8.75
Dallas	2.51*a*	2.26	2.06	1.80	1.80	1.45	1.72	1.82	....	....	.0875*p*	....	8.20
Denver	3.74	2.94	2.69	1.20	1.45	.90	1.65	1.75	....	....	....	.1625*w*	9.00
Detroit	3.28	2.43	2.23*hh*	2.65	2.65	2.35	2.25	2.25	2.00‡	2.00‡	.16	.17*w*	7.85
Kansas City	....	2.60	....	2.00	....	1.40	2.00	2.00	....	....	.16	.16*wy*	8.50*n*
Los Angeles	3.30*rgg*	2.70*r*	....	1.44	1.44	1.33	1.44*f*	1.44*f*	1.44*f*	1.44*f*	.125*bb*	.1*bb*	8.72*m*
Minneapolis	4.10*dd*‡	3.25*dd*‡	....	1.00*h*	1.00*h*	.25*h*	1.00*h*	1.00*h*	....	....	.183*ff*	....	8.45*jkk*
Montreal	....	1.95*r*	1.80*r*	1.65‡*s*	1.65‡*s*	1.60*t*	.80*ct*	.90*ct*	....	....	.1924	....	7.00*ls*
New Orleans	2.41*a*	2.16	1.92	1.67	1.65	1.21	....	....	.90	1.15	.23	....	9.25
New York	4.16‡	3.16‡	....	1.80*deu*	1.80*deu*	1.15*eee*	1.80*de*	1.80*de*	....	....	.16*ii*	.18*wccii*	8.95*kq*
Philadelphia	2.75*a*	2.50‡	2.30‡	1.55‡	1.65‡	1.20‡	1.90‡	1.95‡	1.25	1.25	.155	.155*w*	8.55
Pittsburgh	....	2.55	2.35	1.85‡	1.85‡	2.15‡	2.35‡	2.35‡	1.80	1.80	.23*z*	.23*z*	9.35
St. Louis	3.76*o*	2.88*o*	....	1.81‡*o*	1.81‡*o*	1.71/1.81‡*o*	1.25/1.95	1.25/1.95	.90*g*	1.15*g*	.175	.20*yo*	8.70
San Francisco	2.97*gg*	2.37	2.07	1.46	1.46	1.56	1.56	....	....	....	....	.23*y*	8.55
Seattle	....	2.99*o*	....	2.35*d*‡	2.35*d*‡	2.35*d*‡	2.85‡*od*	2.85‡*od*	....	....	.17	....	8.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* F.o.b. quarry. *d* Per cu. yd. *e* Barge lots alongside docks *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount of 2 percent for cash in 10 days. *l* 2000 lb. concrete. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 5½ x 8 x 12 in. *q* 5 cu. yds. or more. *r* 10c. per bbl. off cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u* In outlying New York districts, price is $1.89. *v* 20c. per bbl. discount; 80c. per bbl. for bags. *w* Cinder. *x* Waylite. *y* Haydite. *z* Celocrete. *aa* Pumice. *bb* 6 x 8 x 12 in. *cc* Also 8 x 18 in. *dd* Prices quoted are LCL. Carload lots not available. *ee* In outlying New York districts, price is $1.22. *ff* 8 x 8 x 18 in. *gg* 20c. allowed for each returnable bag. *hh* Truck shipments. *ii* Yard price. *kk* 2500 lb. compression strength.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICE BASES AT CEMENT MILL

Charge for bags not included. For cloth bags, add $1.05c. per bbl.; 25c. refund allowed for each returnable bag; for paper bags add 20c. per bbl., not refundable.

	Bagged	Bulk
Buffington, Ind	$1.90	$1.85
Hannibal, Mo	1.90	1.85
Independence, Kans	1.90	1.85
Ironton, Ohio	$1.80*	$1.75*
Northampton, Pa	1.75	1.70
Richard City, Tenn	2.05*a*	1.95
Steelton, Minn	2.00	1.95
Universal, Pa	$1.85	$1.90
Waco, Tex. (Plus 9c. tax in Tex.)	1.75	1.80
Montreal City (Discount 10c. per bbl. 20 days)	1.68	1.68

* Destination price base effective Sept. 17, 1945
a For cloth bags, add $1.00.

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS—F. O. B. CITY

	PAVING BRICK AND BLOCK			PAVING ASPHALT Per ton, less than 80 penetration		ASPHALT BINDERS — FLUXES Per gal., 80–300 penetration		CUTBACK ASPHALT Per ton		ROAD OIL Per gal.	ASPHALT EMULSION (Quick-breaking) Per gal.	
	Granite per M lots of 50,000 4x4x8 in.	Brick per M 3x4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$35.00	$2.25	$14.00	.....	$0.074	.....	$0.0806*h*	.....	$0.0781	$0.0806	.....
Baltimore	150.00‡	52.70	85.00*m*	15.00*r*	21.00*r*	.06*r*	0.09*r*	13.00*r*	23.00*r*	.06*r*	.07*r*	.14*r*
Birmingham	.....	32.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Boston	85.00	59.00	3.75	16.00	25.00	.0675	.12	18.00	31.00	.0675	.0875	.15
Chicago	150.00‡	65.00/68.00*e*‡	2.85/4.00*d*	15.00/16.00	23.50	14.15/15.00*g*	22.65*g*	.0625/.0675*h*	.155/.16*h*	.05/.0575	.0925/.1025‡	.135/.155‡
Cincinnati	125.00	66.90	.....	19.40	.....	.10	.....	22.60	.....	.09	.10	.....
Cleveland	127.50	39.00	3.87	17.00	19.00	.085	.085	.10*h*	.11	.08	.....	.....
Dallas	.....	40.00	.....	15.36	22.70	.0618	.12	17.95	28.00	.06	.0725	.135
Denver	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	75.00*t*	.....	17.60*f*	26.56*f*	.0734	.128	.0718*h*	.119*h*	.067	.0974	.135
Kansas City	.....	45.00	.....	15.00*u*	20.60*u*	16.60*g*	.....	.07*h*	.0675*hu*	.....	.11	.15*u*
Los Angeles	.....	50.00	.....	9.00*b*	23.00*b*	9.50*bg*	24.00*bg*	9.50*bg*	.....	.03*b*	.08*b*	.16*b*
Minneapolis	.....	.....	2.39*d*	.....	.....	.....	.....	.....	.....	.....	.....	.....
Montreal	70.00	.....	.....	16.60*k*	24.25*k*	.1035*k*	.111*k*	.115*hk*	.135*hk*	.08*k*	.135*k*	.188*k*
New Orleans	.....	.....	.....	13.00*a*	.....*s*	12.00*g*	.....*s*	5.75	.....*s*	.05	.....	.....
New York	.....	.....	2.75*n*	20.68	30.24*s*	.0834*t*	32.11*g*	.0857*h*	.1376*h*	.0807	.0822	.1328
Philadelphia	150.00	62.00	4.06	16.00	.....	15.00	.....	.0675*h*	.....	.....	14.00*gr*	.....
Pittsburgh	135.00	39.75	3.90	19.00	26.00	.095	.17	22.00	33.00	.075	.085	.14
St. Louis	.....	42.00	.....	14.80	19.80	13.80*g*	18.80*g*	.0587*h*	.1362*h*	.483	.07	.1215
San Francisco	.....	47.75*c*	.....	11.75	21.00	11.75*g*	.....	13.75	.....	.....	.0525	.1125
Seattle	.....	.....	.....	11.75*i*	22.75*i*	9.50	.....	11.75*i*	14.75	10.90*i*	.0525*i*	.0625*i*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* F.o.b. Refinery. *c* 2¼ x 8½ x 4 in. *d* 2-in. interior block, 6-lb. treatment. *e* 3½ x 4 x 8½. *f* Mexican. *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3 x 3¾ x 8½ in. *k* Tax included. *l* Quoted on request only. *m* Per thousand. *n* 2 in., treatment 6 lb. *r* February 1943 prices, none later available. *s* Drums not available. *t* Very scarce. Truck deliveries in small quantities.

December, 1946

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¾-in. billet *b*	RIVETS ¾-in. structural	WIRE NAILS Base	SHEET PILING Base	STEEL RAILS Per Net Ton Standard	STEEL RAILS Light	STEEL RAILS Re-rolled	TRACK SUPPLIES Angle Bars	TRACK SUPPLIES Std Spikes *c*	TRACK SUPPLIES Tie Plates *c*	Track Bolts
Birmingham	$2.35	$2.35	$4.75	$3.75	....	$43.40	$49.18	Not available	$2.85	$3.65	$2.55	$6.50
Chicago	2.35	2.35	4.75	3.75	$2.65	43.40	49.18		2.85	3.65	2.55	6.50
Pittsburgh	2.35	2.35	4.75	3.75	2.65	43.40	49.18		2.85	3.65	2.55	6.50
Buffalo	2.35	2.35	....	....	2.65	.....	.....	.....	....	....	2.55	....
Cleveland	....	2.35	4.75	3.75	....	.....	.....	.....	....	....	....	....
Youngstown	....	2.35	....	....	....	.....	.....	.....	....	3.65	....	....
Detroit	....	2.485‡	....	....	....	.....	.....	.....	....	....	....	....
Gulf ports	2.70*a*	2.735*a*	....	....	2.85*a*	.....	.....	.....	....	....	....	....
Pacific ports	3.00*a*	2.785*a*	....	4.25*a*	3.20*a*	.....	.....	.....	....	3.90	2.70	....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates alone. Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per cl.

IRON AND STEEL PRODUCTS—F. O. B. WAREHOUSE, PER 100 LBS., BASE PRICE

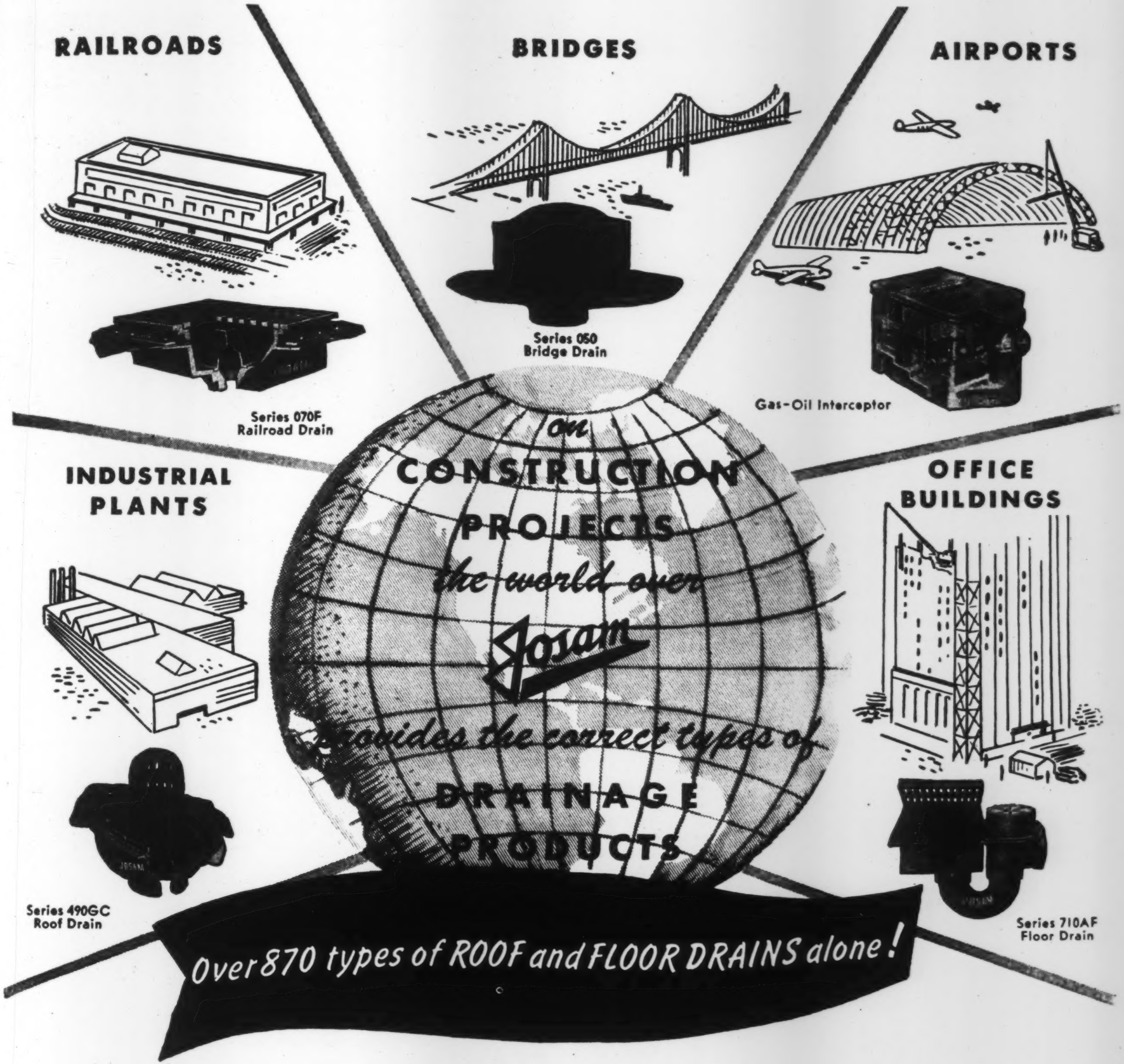
	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS*g* Per 100 lb., ¾ in., base price 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH Per 100 sq. yd., carload lots Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 sq. ft., carload lots 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per 100 s.f.	SHEET PILING Per 100 lb. base price
Atlanta	$4.05‡	$4.12‡	$4.12‡	$.025	$.10	$23.16	$25.30	$1.93	$1.45	$2.05	$3.35
Baltimore	3.909	3.344	....	....	.10	24.50	26.50	1.81	1.37	1.93	3.25
Birmingham	....	....	....	....	.10	19.00	21.00	1.91	1.44	2.03	....
Boston	4.162‡	4.194‡	2.97*c*	$20 C.L.	.10	18.50	20.50	1.87	1.41	1.98	3.02
Chicago	2.35*a*	2.35*a*	2.35*a*	.03	.05	22.50‡	24.50	1.78	1.35	1.89	2.65
Cincinnati	3.983	2.90*cd*	2.90*cd*	....	.10	....*n*	....*n*	1.80	1.36	1.89	....
Cleveland	3.838	4.00	3.98	.025	.10	20.50	24.50	1.77	1.35	1.88	....
Dallas	5.25	4.17	4.17	....	....	25.50	27.50	2.04	1.52	2.17	....
Denver	4.89	4.77*o*	....	....	....	37.00	41.00	2.08	1.55	2.21	....
Detroit	3.952‡	3.14‡	3.14‡	....	.10	38.00‡	41.00‡	1.79	1.36	1.90	2.95
Kansas City	4.44	2.75*cd*	2.75*cd*	.0	.05	29.50	31.50	1.89	1.43	2.01	3.0826
Los Angeles	4.45*f*	3.025	2.875	.03	.05	23.00	27.50	2.04	1.52	2.17	4.45
Minneapolis	4.142‡	2.99	2.99	.0	.10	25.00	27.00	1.91	1.44	2.03	3.06*d*
Montreal	3.95*i*	3.10*i*	3.00*i*	....	....	31.00*hi*	46.00*hi*	2.87	3.54*i*	2.96*im*	....
New Orleans	4.408‡	3.84	4.108	.05	.10	22.00	24.00	1.93	1.45	2.05	3.125
New York	4.008	2.96*c*	2.96*c*	....	.15	17.50	19.50	1.83	1.39	1.95	2.74
Philadelphia	3.937	3.899	....	....	....	20.50‡	22.50‡	1.82	1.38	1.93	2.97
Pittsburgh	2.35*a*	2.35*a*	2.35*a*	.025	.10	23.00	26.50	1.70	1.30	1.81	2.65
St. Louis	3.401	2.96	2.96	.0	.05	29.00	35.00	1.80	1.37	1.92	....
San Francisco	4.40	3.025	2.875	.025	.10	28.00	31.50	2.04	1.52	2.17	3.335
Seattle	3.00*e*	3.00*e*	....	....	....	43.50	44.00	2.04	1.52	2.17	3.20*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax. *m* Per sq. yd. *n* Practically no carloads are available. Retail price delivered is $27.00 for std. diamond mesh and $29.00 for std. ribbed. *o* 20 tons and over.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in. *a*	VITRIFIED SEWER PIPE Per foot, Delivered std. 8 in. s.s.	std. 12 in. s.s.	24 in.	36 in.	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM 12 in.	C 14–41 24 in.	WROUGHT STEEL PIPE (Full standard weight, f.o.b. destination *s*) 1 to 3 in., Butt Weld Black %	Galv. %	3½ to 6 in., Lap Weld Black %	Galv. %
Atlanta	$65.66	$0.43	$0.67	$3.39	....	$114.00	$140.00	$0.45	$2.00	58.5	47.5	56.0	44.5
Baltimore	70.20	.35	.60	2.70	$7.25	160.00	200.00	.85	2.25	62.1	51.1	59.6	48.1
Birmingham	61.00	.35	.63	2.736	....	200.00	350.00	.57	1.80	58.5	47.5	56.0	44.5
Boston	72.80	.392*m*	.756*m*	3.15*m*	7.995*m*	170.00‡*m*	265.00‡*m*	.53*h*	2.04*h*	66.0	49.6	58.1	46.6
Chicago	70.33	.49	.945	3.60	....	110.00‡	150.00‡	.65	2.25	64.0*t*	53.0*t*	60.5*t*	49.0*t*
Cincinnati	69.27	.327	.6345	3.735	10.04	98.70	151.60	.36	1.60	62.6	51.6	60.1	48.6
Cleveland	70.75	.226*q*	.513*q*	2.15*q*	5.535*q*	138.50	216.60	.36	1.60	64.71	53.71	62.21	50.71
Dallas	72.43	.365	.657	2.664	6.00	108.00	130.00	.46	1.75	56.5	45.5	53.9	42.4
Denver	77.56	.36	.648	2.70	....	154.00‡	295.00‡	.50	2.00	54.4	43.4	51.6	40.1
Detroit	70.75	.455	8.775	3.375	8.50*l*	170.00‡*m*	263.00‡*m*	.40	1.75	63.1	52.1	60.6	49.1
Kansas City	71.73	.345	.625	2.47	6.85	173.00	312.00	.45	1.60	60.1	49.1	57.2	45.7
Los Angeles	84.40	.36†	.648†	2.988	7.47	130.50	217.50	1.25	2.50	....	....	....	....
Minneapolis	73.83	.44†*o*	.825†*o*	3.24†*o*	....	......	......	.90*h*	2.40*h*	60.2	49.2	57.3	45.8
Montreal	74.20	.85*k*	1.50*k*	5.25*l*	8.50*el*	45.00*j*	64.00*j*	.811*j*	2.51*j*	....	....	....	....
New Orleans	67.78	.31	.558	3.558	....	112.00	......	....	....	58.0	47.0	55.5	44.0
New York	69.60	.52	.96	3.82	9.18	......	......	.60	1.40	61.5	50.5	59.0	47.5
Philadelphia	68.10	.40	.7735	3.20	8.50	200.00	275.00	.80*h*	2.15*h*	61.9	50.9	59.4	47.9
Pittsburgh	71.18	.322†*m*	.631†*m*	2.70†*m*	6.625*m*	124.20	193.80	1.05*h*	2.50*gh*	65.25*t*	54.25*t*	62.75*t*	51.25*t*
St. Louis	68.84	.351*n*	.632*n*	2.527*n*	5.60*n*	105.80	212.00	1.00*h*	2.15*h*	61.9	50.9	58.6	4.71
San Francisco	84.40	.3875*d*	.6975*d*	2.79	6.975	124.50	207.50	.58	2.34	....	....	....	....
Seattle	86.20	.4375*b*	.7875*b*	3.15	....	.....	......	.56*f*	1.60*f*	....	....	....	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, Burlington, N. J. (base) $66.00. Based on existing freight rates; subject to rate change. Gas pipe and class A, $5 per ton additional. 4 in., $5 per ton additional, 30 in. and larger, usually $1 per ton less. *b* Double strength. *d* List. *e* 30 in. *f* Less 5% for cash. *g* Culvert pipe. *h* Reinforced. *j* Centri-spun. *k* Less 50%. *l* Less 53%. *m* Truck delivery. *n* Less 3% for cash. *o* Carload lots not available at this time, so listed price is based on LCL (no minimum). *q* F.o.b. cars. *s* Discounts from standard list consumers carload prices. Base price approx. $200 per net ton. List prices per ft.: ½ in., 8½c.; ¾ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92; 3 percent tax on transportation costs not included. *t* Within switching limits. WROUGHT IRON PIPE: List prices per ft. same as wrought steel pipe. Discount for Pittsburgh base. Buttweld — 1 in. and 1¼ in. black, 34, galv., 16; 1½ in. black, 38, galv., 18½; 2 in. black, 37½, galv., 18. Lapweld — 2½ in. to 3½ in. black, 31½, galv., 14½; 4½ in. to 8 in. black, 32½, galv., 17. Freight rates to destination to be added to name delivered price.



RAILROADS
BRIDGES
AIRPORTS
Series 050
Bridge Drain
Gas-Oil Interceptor
Series 070F
Railroad Drain
INDUSTRIAL
PLANTS
on
CONSTRUCTION
PROJECTS
the world over
Josam
provides the correct types of
DRAINAGE
PRODUCTS
OFFICE
BUILDINGS
Series 490GC
Roof Drain
Series 710AF
Floor Drain
Over 870 types of ROOF and FLOOR DRAINS alone!

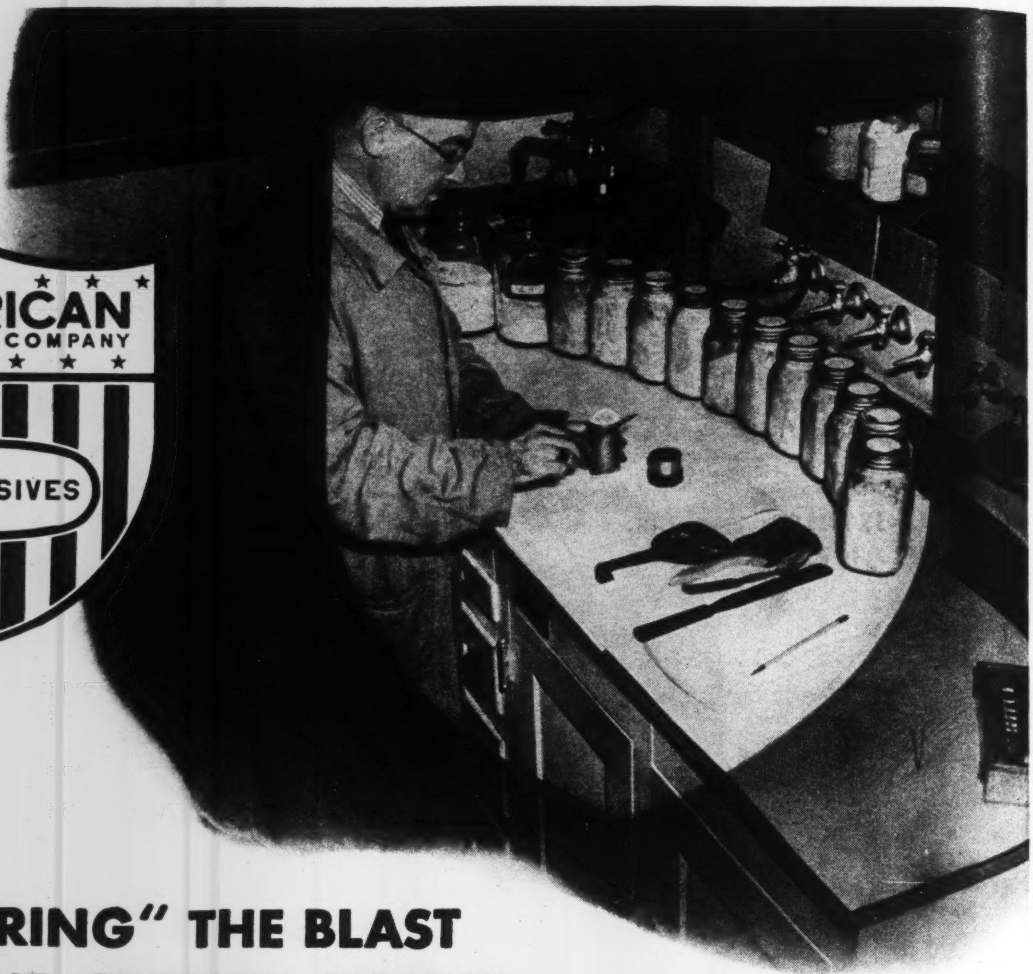
THE selection of the right types of drainage products for a building project can be *difficult, perplexing* and *costly* . . . unless you are an expert on drainage. Yet, the toughest drainage problem can be easily solved by submitting it to Josam, for Josam has been the leader in pioneering, and producing drainage products for over 30 years. Even though the condition looks "special", chances are that there is already a product in the Josam line designed to meet the need exactly. For example, there are over 870 types of Josam roof and floor drains *alone* manufactured today. When drainage is so important to the life of a building project, why take chances—Josam takes the guess-work out of the drainage problems for you. On any drainage installation experience proves that it always pays to get the details *first* on Josam products. Use convenient coupon below for quick-reply information.

DRAINS AND DRAINAGE PRODUCTS FOR EVERY TYPE OF BUILDING PROJECT

Josam Products
STANDARD OF AMERICA

JOSAM MANUFACTURING COMPANY
General Offices, Ferguson Building, Cleveland 14, Ohio • Plant, Michigan City, Indiana
Representatives in all Principal Cities
JOSAM-PACIFIC CO., 765 Folsom Street, San Francisco, California — West Coast Distributors
EMPIRE BRASS COMPANY, LTD., London, Ontario — Canadian Distributors
See our Catalog in Sweets' *Member of the Producers Council*

FILL IN AND MAIL COUPON TODAY
JOSAM MANUFACTURING CO., 360 Ferguson Bldg., Cleveland 14, Ohio
Please send without obligation details on following:
☐ Floor Drains ☐ Shower Drains ☐ Backwater Sewer Valves
☐ Roof Drains ☐ Interceptors ☐ Swimming Pool Drains
☐ Other Drainage Products..............................
For (Type of Building or Project)..............................
NAME..............................
FIRM..............................
ADDRESS..............................
CITY and STATE..............................



AMERICAN
CYANAMID COMPANY
EXPLOSIVES

"TAILORING" THE BLAST TO YOUR SPECIFIC NEEDS!

Testing ammonium nitrate for sizing and density to control rate of detonation is just one of many painstaking laboratory procedures behind each grade of AMERICAN Explosives. For, whatever your blasting requirements, there is a grade of AMERICAN Explosives "tailored" specifically to meet them. And intensive laboratory research, close chemical control, and unremitting care throughout the manufacturing process guarantee that the grade you select will do its assigned job efficiently and economically.

- *Capable field engineers are available at your call.*

- ★ **HIGH EXPLOSIVES**
- ★ **PERMISSIBLES**
- ★ **BLASTING POWDER**
- ★ **BLASTING ACCESSORIES**

AMERICAN CYANAMID COMPANY
EXPLOSIVES DEPARTMENT
30 ROCKEFELLER PLAZA • NEW YORK 20, N. Y.

SALES OFFICES: PITTSBURGH, PA. • BLUEFIELD, VA. • SCRANTON, PA. • CHICAGO, ILL. • POTTSVILLE, PA. • MAYNARD, MASS.

December, 1946

LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. **(Prices in Bold Face)** *All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)*									LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD Rail freight increment (See note for base price)	
	1x6 s4s	1x8 s4s	2x4 s4s	2x6 s4s	2x8 s4s	2x10 s4s	3x12 Rgh	6x12 Rgh	12x12 Rgh	2x12 Rgh	12x12 Rgh	5/8"	3/4"
Atlanta	**$48.25**	**$48.25**	**$46.75**	**$46.25**	**$47.25**	**$49.75**	......	......	......	$71.00	$71.00	$17.72	$21.37
	62.50	*62.50*	*61.00*	*61.00*	*60.00*	*60.00*	*$54.00*	*$53.50*	*$52.50*	......	......	......	......
Baltimore	**74.00**	**75.00**	**71.00**	**70.00**	**70.00**	**77.00**	**90.00**	......	......	185.00	180.00	18.45	21.995
	80.00	*82.00*	*80.00*	*74.00*	*79.00*	*80.00*	*95.00*	*87.00*	*85.00*	......	......	......	......
Birmingham	**85.00**	**85.00**	**84.50**	**83.50**	**84.50**	**87.50**	**108.00**	......	......	107.50	110.00	17.245	20.795
[1]	*90.00*	*90.00*	*89.50*	*88.50*	*89.50*	*92.50*	*112.00*	*95.00*	*96.00*	......	......	......	......
Boston	70.00^3	72.00^3	66.50^3	62.50^3	70.50^3	74.50^3	70.25^3	......	......	......	......	18.195	21.995
	64.75	*64.75*	*62.75*	*63.25*	*62.75*	*62.75*	*60.50*	*59.50*	*59.50*	*59.50*	......	......	......
Chicago ‡	**65.00**	**66.00**	**62.00**	**62.00**	**62.00**	**69.00**	**75.00**	......	......	97.00	97.00	14.555	17.555
	65.50	*65.50*	*65.50*	*65.50*	*65.50*	*66.50*	*67.50*	*63.00*	*64.00*	......	......	......	......
Cincinnati	**51.00**	**52.50**	**46.00**	**46.00**	**48.00**	**56.00**	**70.50**	......	......	68.50	68.50	17.245	20.795
Cleveland	**58.50**	**58.50**	**56.50**	**55.50**	**56.25**	**58.25**	**65.00**	......	......	......	91.75	17.615	21.265
	64.50	*64.50*	*58.50*	*54.50*	*54.50*	*55.75*	*63.75*	*58.75*	*57.75*	......	......	......	......
Dallas	**54.50**	**54.50**	**52.75**	**51.75j**	**52.25**	**54.00**	**56.50**	**59.50**	**59.50**	89.75	86.00	14.555	17.555
Denver	*77.25*	*77.25*	*73.50*	*73.50*	*72.50*	*73.50*	*74.50*	*76.00*	*76.00*	......	......	10.285	12.435
Detroit	**90.00**	**90.00**	**87.00**	**87.00**	**87.00**	**93.00**	**100.00**	......	......	95.00	110.00	17.245	20.795
	98.00	*98.00*	*96.00*	*97.00*	*97.00*	*100.00*	*105.00*	*105.00*	*110.00*	......	......	......	......
Kansas City *a*	**76.00**	**76.00**	**74.00**	**72.75**	**73.25**	**76.00**	**95.00**	......	......	95.00	100.00	12.605	15.205
	78.00	*78.00*	*77.50*	*77.50*	*75.50*	*77.00*	*75.00*	*95.00*	*95.00*	......	......	......	......
Los Angeles *a*	*74.00*	*74.00*	*74.00*	*74.00*	*74.00*	*74.00*	*80.00*	*79.50*	*79.00*	......	......	9.81*gh*	11.86*gh*
Minneapolis ‡*b*	84.00^6	82.50	......	......	......	......	......	......	......	......	......	13.765	16.615
‡	*85.00*	*85.00*	*79.75*	*80.00*	*78.75*	*80.25*	*74.50*	*76.25/84.25*	*76.75/84.75*	......	......	......	......
Montreal *e*^{7}	69.00	70.00	64.00	68.00	70.00	75.00	......	......	......	.20*i*	.20*i*	......	......
	97.00	*97.00*	*97.00*	*97.00*	*97.00*	*97.00*	*87.00*	*87.00*	*87.00*	......	......	......	......
New Orleans	**67.00**	**67.00**	**69.00**	**65.00**	**65.00**	**72.00**	**99.00**	......	......	**84.00**	97.00	14.555	17.555
New York ‡	**Range from $95.00 to $110.00**						**$105 to $120**	......	......	......	......	18.195	21.995
‡	*Range from $90 to $120*									......	......	......	......
Philadelphia	**85.00**	**85.00**	**85.00**	**85.00**	**85.00**	**85.00**	**85.00**	......	......	140.00	140.00	18.195	21.995
	90.00	*90.50*	*90.00*	*90.00*	*90.00*	*90.00*	*90.00*	*100.00*	*100.00*	......	......	......	......
Pittsburgh	**59.40**	**61.80**	**71.35**	**63.60**	**69.45**	**73.10**	**84.85**	......	......	130.60	141.00	17.88	21.63
	77.60	*76.70*	*74.70*	*73.90*	*73.80*	*74.35*	*91.35*	*96.85*	*96.85*	......	......	......	......
St. Louis	**71 50**	**71.50**	**70.50**	**69.25**	**70.00**	**72.50**	**82.75**	*83.25*	*82.00*	107.00	104.25	14.555	17.555
San Francisco *d*	*76.00*	*76.00*	*72.25*	*72.25*	*71.25*	*71.25*	*66.00*	*62.50*	*62.50*	......	......	7.33*g*	8.83*g*
Seattle	*50.50a*	*50.50a*	*50.50a*	*50.50a*	*50.50a*	*50.50a*	*45.00a*	*45.00a*	*45.00a*	......	......	......	......

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers' N. C. Pine. [3] Spruce. [4] Native. [6] Western Pine, No. 3 Common. [7] Spruce. [8] Norway Pine. ‡ Delivered. *a* Yard prices. *c* 5M ft. or less. *d* Sales through wholesale distribution yard (F.o.b. purchaser's truck or carrier, San Francisco paid). *e* Plus sales tax. *f* Up to 18 ft. *g* Lower rate by water shipment. *h* 50,000 lb. minimum. *i* FBM, scarce, no stable quotation, no ceiling.

Note: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface-Seattle base price on 5/8", $95.15; on 3/4", $104.85; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Aug. 15, 1938 Single or Double Thickness		EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50 lb. cases delivered in 200 lb. lots*
	A quality	B quality	
Atlanta	74%	75%	$0.18
Baltimore	78%	79%	.18
Birmingham	76%	76%	.135
Boston	77%	78%	.18
Chicago	725%	725%	.18
Cincinnati	77–10%	77–10%	.18
Cleveland	77%	77%	.22
Dallas	76%	76%	.1925
Denver	72%	72%	.185
Detroit	77%	77%	.18
Kansas City	77–10%	77–10%	.18
Los Angeles	86%*d*	88%*d*	.1875
Minneapolis	73%	73%	.175
Montreal	40–5%*ab*	47%*ac*	.1975
New Orleans	70%	75%	.19
New York	76%*e*	77%*e*	.25*f*
Philadelphia	74%	75%	.18
Pittsburgh	77%	77%	.1525
St. Louis	77–10%	77–10%	.185
San Francisco	66%	73%	.185
Seattle	75%	75%	.1875

Price of 60% Ammonia Gelatin is $0.01 per lb. higher than 40%

a Discount from list Sept., 1939; sales tax included, but 6% tax exemption not allowed for. *b* Single thickness. *c* Double thickness. *d* Discount from jobbers, list Sept. 15, 1928. *e* Discount from jobbers' list Jan. 16, 1946. *f* In borough of Kings, Queens and Richmond, and in Manhattan south of Canal St., add delivery charge of $6.00 per trip.

* Urban prices influenced by service charges or local storage and delivery regulations do not consistently reflect quantity prices in less congested areas.

40% Ammonia Gelatin price ranges in other than urban areas, per lb.
(except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.135	$0.16	$0.18
W. of Miss. to Rocky Mtn. States, Fla. and Maine.	.14 –.1475	.165 –.1775	.185 –.1975
Rocky Mtn. States	.14 –.1525	.165 –.1825	.185 –.2025
Pacific N. W. States*	.1375–.15	.1675–.18	.1875–.20
Pacific S. W. States	.1350–.1425	.165 –.1725	.185 –.1925

PILES, TIES F. O. B.

PILES

Prices per linear foot, fir and pine, bark on, f.o.b. cars, New York. Fir based on Wash. and Ore. points to New York shipping area; pine based on freight from Norfolk.

			By Rail	
Dimensions	Points	Length	Pine*	Fir
12-in. at butt	6-in.	30 to 50-ft.	$0.34	....
12-in.—2 ft. from butt	6-in.	50 to 59-ft.	.35	....
12-in.—2 ft. from butt	6-in.	60 to 69-ft.	.36	....
12-in.—2 ft. from butt	6-in.	90 to 100-ft.	....	.56
13-in.—3-ft. from butt	5-in.	91 to 100-ft.	....	.58
14-in.—2-ft. from butt	6-in.	50 to 69-ft.	.41	.65
14-in.—2 ft. from butt	6-in.	70 to 79-ft.	.43	.59
14-in.—2 ft. from butt	5-in.	80 to 85-ft.	.54	....
14-in.—2 ft. from butt	5-in.	85 to 89-ft.	.57	....
14-in.—2 ft. from butt	5-in.	90 to 100-ft.	....	.64

* Pine piling over 80-ft. available only in limited quantities.

RAILWAY TIES

Prices f.o.b. per tie for carload lots:		6"x8"x8'		7"x9"x8'6"	
		Untr.	Tr.	Untr.	Tr.
Boston	Oak	$1.50	.....	$2.00	.....
	Pine	2.00	$3.00*a*	2.50	$3.00*a*
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76	2.86
	Mixed Oak	1.71	2.59	2.42	3.58
Birmingham	Hardwood	1.00	1.60*a*	....	2.25*a*
Chicago	Red Oak	....	2.45/2.65*a*	....	3.35/3.60
Los Angeles	Douglas Fir	2.10	3.35*a*	3.00	4.80*a*
Philadelphia	Red Oak	....	2.10*ag*	....	3.25*ag*
St. Louis	White Oak	1.80	....	2.40	....
	Red Oak	1.73	2.25*a*	2.19	3.25*a*
	Sap Pine or Cypress	1.80	....	2.06	....
San Francisco	Douglas Fir	1.25*bet*	....	....	3.00*caf*
Montreal	Birch or Maple	....	1.65	1.04	....

Tr.—Treated; Untr.—Untreated. *a* Creosoted. *b* 6"x8"x8'6". *c* Empty cell. *d* Zinc. *e* Green. *f* F.o.b. cars. † Out of market. *g* January 1943 price, none later available.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder in drums, f.o.b. works, per 100-lb.	$2.50– 3.10
Chlorine cylinders, liquid, per lb. delivered	.0525
Calcium chloride, 77–80%, flaked, 100-lb. paper bag, del'd, ton	18.50–35.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb.	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags	1.15–1.20
Sulphate of copper, in bbl., per 100-lb.	5.00

DISTRIBUTORS

ALABAMA
Birmingham—YOUNG & VANN SUPPLY CO.
ARIZONA
Phoenix—MOORE & SHELTON EQUIP. CO.
ARKANSAS
North Little Rock—STANDARD EQUIP. and SUPPLY CO.
CALIFORNIA
Oakland and Fresno—DURAN EQUIP. CO.
Los Angeles—CARLINGHOUSE BROTHERS
COLORADO
Denver—CONDERSON-KRINGEL CO.
CONNECTICUT
Stamford—M. F. TAYLOR CONSTRUCTION EQUIPMENT & SUPPLIES
FLORIDA
Jacksonville—FARQUHAR MACHINERY CO.
Miami—GENERAL EQUIP. & SUPPLY CO.
Tampa—EPPERSON & CO.
GEORGIA
Atlanta—GILL EQUIPMENT CO.
ILLINOIS
Chicago—CENTRAL CONTRACTORS SERVICE
Mt. Vernon—ED MEYER TRACTOR COMPANY
Rock Island—WESTERN EQUIP. & SUPPLY CO.
INDIANA
Indianapolis—BOCK EQUIPMENT CO.
Rochester—DEEDS EQUIPMENT CO.
IOWA
Cedar Rapids and Des Moines—GLOBE MACHINERY & SUPPLY CO.
KENTUCKY
Louisville—NATIONAL EQUIPMENT CO.
Paducah—HENRY A. PETTER SUPPLY CO.
LOUISIANA
Baton Rouge, Monroe and New Orleans—DUNHAM-PUGH CO., INC.
MAINE
Portland—EASTERN TRACTOR & EQUIP. CO.
Presque Isle—ROY C. THOMPSON CO.
MARYLAND
Baltimore—MARYLAND SUPPLY & EQUIP. CO.
MASSACHUSETTS
Boston—PERRIN, SEAMANS & CO., INC.
MICHIGAN
Detroit—W. H. ANDERSON COMPANY, INC.
Grand Rapids—E. K. S. EQUIPMENT CO.
Marquette—MARQUETTE PUBLIC SERVICE GARAGE, INC.
MINNESOTA
Duluth and St. Paul—BORCHERT-INGERSOLL, INC.
MISSISSIPPI
Jackson—WATKINS-ALDRIDGE EQUIP. CO., LTD.
MISSOURI
Kansas City—CONTRACTORS SUPPLY CO.
St. Louis—MISSOURI-ILLINOIS TRACTOR & EQUIPMENT CO.
MONTANA
Butte and Great Falls—MONTANA HARDWARE CO.
NEBRASKA
Omaha—FEHRS TRACTOR & EQUIP. CO.
NEVADA
Reno—NEVADA TRUCK SALES
NEW JERSEY
Union—SMITH TRACTOR & EQUIP. CO.
NEW MEXICO
Albuquerque—HARRY CORNELIUS CO.
NEW YORK
Albany—VAN [illegible] PUMP & SUPPLY CO.
Buffalo—FOX EQUIPMENT CO.
New York—H. O. PENN MACHINERY CO.
Rochester—HAVERSTICK & CO.
Utica—CREEDLE EQUIPMENT CO.
NORTH CAROLINA
Charlotte—CONTRACTORS SERVICE, INC.
NORTH DAKOTA
Fargo—MYHRA EQUIPMENT CO.
OHIO
Cincinnati—THE FINN EQUIPMENT CO.
Cleveland—PATTERSON EQUIPMENT CO.
Columbus—BLAKE EQUIPMENT CO.
Marietta—NORTHWEST SUPPLY & EQUIP. CO.
Toledo—EDMUND SUPPLY CO.
OKLAHOMA
Oklahoma City—THE BOARDMAN CO.
OREGON
Portland—COLUMBIA EQUIPMENT CO.
PENNSYLVANIA
Philadelphia—METALWELD, INC.
Pittsburgh—BRINKER SUPPLY CO.
SOUTH CAROLINA
Columbia—TIDEWATER SUPPLY CO., INC.
TENNESSEE
Knoxville and Nashville—DEMPSTER BROS.
Memphis—HOWELL EQUIPMENT CO.
TEXAS
El Paso—DON A. CARPENTER CO.
Houston—SOUTH TEXAS EQUIPMENT CO.
Lubbock—FRED BERRYHILL EQUIP. CO.
San Antonio—ACME WIRE AND IRON WORKS
Waco—CONTRACTORS EQUIPMENT SALES & SERVICE, INC.
UTAH
Salt Lake City—THE LANG CO., INC.
VIRGINIA
Norfolk and Roanoke—TIDEWATER SUPPLY CO.
Richmond—INDUSTRIAL SUPPLY CO.
WASHINGTON
Seattle and Spokane—COLUMBIA EQUIP. CO.
WEST VIRGINIA
Charleston—CLYDE W. BECKNER, INC.
WISCONSIN
Milwaukee—STONE MANUFACTURING CO.
Park Falls—STEIGER MOTOR SALES

NOVO NEWS

APRIL, 1947

NOVO NEWS

JANUARY, 1947

"Pronto-Prime" Survives Cave-ins, Runs 1,008 Consecutive Hours!

Dug Out, It's Ready to Run After a Bath

The scene is Bremen, Indiana. Construction workers under Arthur M Keyser, Superintendent of Light and Water, are struggling against odds to lay a sewer line in wet, sandy soil three feet below the water table. The ditch resembles a small river despite all efforts to keep it dry. Pump after pump fails. The sandy water and eleven to seventeen-foot lift are too much. Finally, Mr Keyser adds a Novo "Pronto-Prime" pump.

In true Hollywood style, cave-ins bury the "Pronto-Prime." Fearfully, workers dig it out time after time—remove the cleanout plate—dash in some water—bake the magneto dry—reinstall it—start the engine. Instantly, as if being buried alive were nothing, "Pronto-Prime" is at work again ... runs steadily for 1,008 hours!

...and Here's the Sequel— It's *Still* Going Strong!

"It's Sure a Dandy," Says Septic Company Chief

J. G. FRANCIS

"The best performing, self-priming centrifugal pump I've ever operated," is what President J. G. Francis of Superior Septic Tank Co., Detroit, says about the "Pronto-Prime." "It's easy to prime, doesn't require any attention, throws the water regardless of whether the lift is 5 or 15 feet, and runs four or five hours on a gallon of gas. It's a dandy!"

Other Novo Equipment

Novo contractors' equipment includes diaphragm pumps, pressure pumps, hoists, generator sets, pavement breakers, traffic line-markers, and engines.

By all odds, this Novo "Pronto-Prime" pump should have been awarded the Purple Heart and retired from service long ago.

It's the 1½-inch pump which did the impossible at Bremen, Indiana . . . was rescued from repeated cave-ins . . . ran steadily for 1,008 consecutive hours . . . then licked other jobs without repairs of any kind.

And it's still going strong! Right now, this same "Pronto-Prime" is pumping water heavily laden with quicksand. In sewer work being done by the Superior Septic Tank Company of Detroit, the pump is started in the morning, swishes out the water, runs idle for 15 to 60 seconds, pumps again, idles again — continues the cycle for hours without attention.

The performance record of this pump is convincing proof of the efficiency of the Novo stout-hearted seal and the sturdiness of its over-all construction.

NOVO
ENGINE COMPANY
LANSING 5, MICH. U.S.A.

CONTRACTOR'S EQUIPMENT
· GRAY IRON CASTINGS ·
ENGINES

December, 1946

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE PARTITION — SCORED Per M. lots of 2,000 pieces or over,			STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over,			BRICK Per M. in quantity		LIME		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Per ton, Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized, or lump
Atlanta	$112.50	$132.60	$234.60	$244.80	$273.40	$306.00	$24.00	$24.00	$19.00	$17.50	$17.50
Baltimore	90.00	95.00	175.00	200.00	260.00	300.00	23.75*k*	29.75*k*	20.00	15.00	2.50*m*
Birmingham	91.00	96.00	133.00*c*	216.00	......	......	18.50	21.00	19.11	15.05	16.05
Boston	105.00†	112.00†	210.10†	252.09†	......	......	20.00*i*	20.00*i*	21.00†	.....	16.00
Chicago	92.10	98.40	185.20	......*x*	......*x*	......*x*	18.50	19.50	18.00	16.00	.....
Cincinnati	75.39	80.39	150.90	170.91	242.35	277.25	33.00	33.00	16.90	14.40	.....
Cleveland	98.10	104.55	......*x*	196.00	......	......	24.00	24.00	17.05	14.55	19.55
Dallas	77.25	83.00	165.00	198.00	254.50	315.00	17.25	19.00	19.00	15.00	15.00
Denver	105.25	119.00	198.25	230.00	263.50	315.25	26.50	28.00	30.00*j*	28.00*j*	34.00
Detroit	92.70	96.70	174.50	198.80	257.20	294.30	24.00*f*	25.00*f*	22.00	20.00	20.00
Kansas City	......	......	......	......	......	......	17.50	18.50	30.40	24.00	24.00
Los Angeles	87.50†*r*	103.00†	142.00*c*†*r*	217.50†*r*	375.00†*r*	470.00†*r*	16.50	18.50	16.50	17.50	17.50
Minneapolis	......	......	......	......	......	......	18.50*v*	.....*g*	29.20*bb*	21.00*bb*	22.00*bb*
Montreal	92.50*a*	98.50*a*	196.25*a*	151.50*a*	......	294.40*a*	22.16†*u*	29.41†*u*	12.50*u*	14.00*u*	8.00*u*
New Orleans	104.50	109.55	207.25	222.25	326.90	385.65	17.75	.....	18.30	12.08	14.10
New York	103.90	110.80	152.35	164.20*hn*	......*x*	......*x*	25.50	.....	27.60	22.80	.....
Philadelphia	112.10	119.60	224.20	269.10	321.20	405.10	24.75	27.75	22.00	18.00	17.00
Pittsburgh	98.50	105.80	181.85	217.30	265.85	303.10	23.25	25.25*y*	19.40*cc*	16.90*cc*	2.85*m*
St. Louis	......	......	......	......	......	......	26.00*s*	25.00*s*	24.00*s*	20.00*s*	.68*z*
San Francisco	102.40	115.20	153.60	115.20*t*	......	......	25.00	.....	20.90	20.90	2.08*m*
Seattle	129.25	141.50	......*x*	141.50*cc*	......	......	23.00*k*	28.00*k*	27.95*s*	27.95*s*	3.28*m*

*F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6 x 12 x 12 in.-3 cell. *f* Includes $3.50 per M. for delivery. *g* No quotation. *h* F.o.b. Perth Amboy, N. J. *i* F.o.b. Warehouse only. *j* OPA Price. *k* $1.00 discount. *m* Per bbl., 180 lb. *n* 7¾ x 7¾ x 12 Speed tile. *o* Per bbl., 200 lb. *r* 5% discount 10 days. *s* 2% discount for cash. *t* 5½ x 8 x 11½. *u* 8% sales tax included. *v* Sand lime. *x* Not available. *y* Stacked. *z* Pebble lime, price per 80 lb. sack. *bb* LCL, delivered. *cc* Truck delivery.

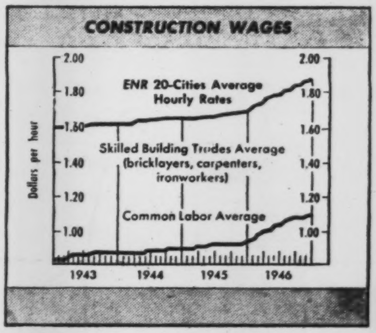
PAINT, ROOFING—F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in 100 lb. cases Reverse order In oil *w*	READY-MIXED PAINT			ROOFING SUPPLIES Carload lots f.o.b. factory				
			Graphite *b*	Per gal., drums Aluminum *c*	Ferric Oxide *d*	Rolls, slate surfaced, 85–90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 360 lb. bbl., per ton
Atlanta	$15.50	$23.625	$1.75	$2.70	$1.65	$2.06	$2.06	$2.06	$1.00	$36.00
Baltimore	15.25	23.25	2.00	3.00	2.50	2.35	2.90	2.90	.40	29.00
Birmingham	15.50	23.625	2.54	4.00	2.25	2.35	2.27	2.27	.33	29.42
Boston	15.25	23.25	1.75	2.50	2.31	2.00‡*h*	3.30‡*ut*	3.30‡*ut*	.25‡	21.00‡
Chicago	15.25	23.25	....	....	....	1.75*hf*	1.99*hf*	1.99*hf*	.33*f*	23.00*f*
Cincinnati	15.25	23.25	1.70	2.90	1.60	2.20	2.10*h*	2.10*h*	.33	25.00
Cleveland	15.25	23.25	....	....	....	1.71	1.63*h*	1.61*h*	.237	25.00
Dallas	15.25	24.00	1.88	2.95	.06*l*	1.89*h*	2.00*h*	2.00*h*	.65	37.00
Denver	15.25	23.75	2.22	4.11	2.82	2.53	2.36*h*	2.36*h*	.29	29.00
Detroit	15.25	23.25	1.75	3.00	1.60	2.25	2.25	2.25	.50	23.00
Kansas City	15.25	23.375	2.30*g*	2.55*g*	2.16*g*	2.50	2.75	2.75	.52	.....
Los Angeles	15.50	23.75	2.30	3.00	2.75	2.25	1.65	....	.50	.....
Minneapolis	15.25	23.125	....	....	....	1.90*i*	1.85*hi*	1.85*hi*	.32	23.00
Montreal	.....	.....	2.50*p*	4.90*p*	3.15*p*	2.85	2.45*t*	2.45*t*	.84	1.83*k*
New York	15.25	23.25	2.91	....	2.70	1.995	2.0465*o*	2.0465*o*	.26	26.00
Philadelphia	15.25	23.25	1.60/1.80	2.20	1.55	2.30	2.81	2.81	.32	23.00
Pittsburgh	15.25	23.25	1.95	2.40	1.75	2.15	2.09*h*	2.09*h*	.34	27.00
St. Louis	15.25	23.25	2.28*s*	2.89*s*	1.96*s*	2.01*h*	2.01*h*	2.01*h*	.46	28.00
San Francisco	15.50	23.50	1.80	2.75*n*	1.35	1.7613	4.72	2.472	.3399	21.115
Seattle	15.50	23.75	1.95	3.09	....	2.22	2.23*h*	....	.36	31.93*j*

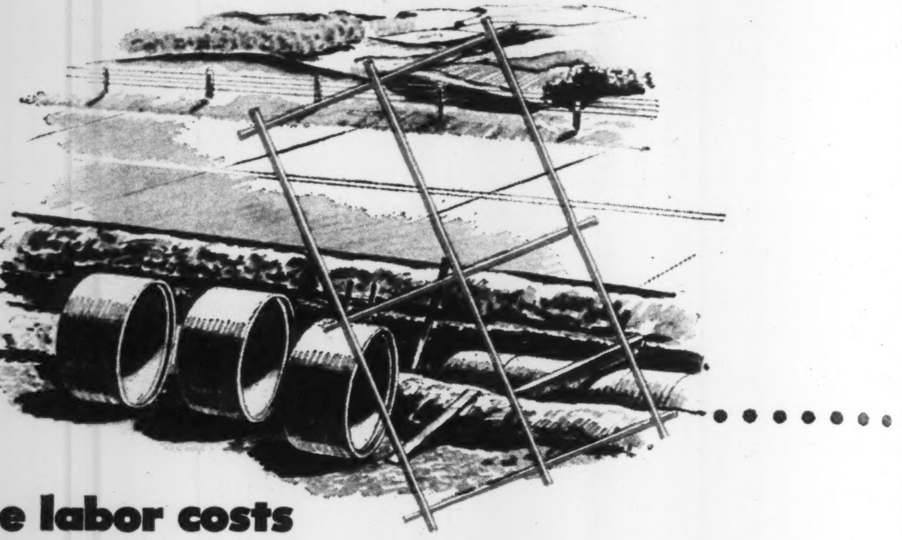
‡ Delivered. Note: Red lead in oil 50c higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U.S. War Dept Spec. 3–49A. *c* ASTM Spec. D236–31. *d* 80% minimum ferric oxide. *f* Distributors' price to contractors. *g* 55 gal. can. *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* per cwt. *n* May, 1941 price. *o* 60-lb. roll. *p* Plus 8% sales tax. *s* December, 1942 price. *t* Federal tax included. *u* 90-lb. roll. *v* Truck delivery. *w* Price to large paint contractors is $1.25 less.

SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor	
						Building	Heavy Const.
Atlanta	$2.00	$1.50	$1.625	$1.50	$1.62	$0.75	$0.80
Baltimore	1.90	1.775	2.00	1.625/2.00	1.90	.95	.95
Birmingham	1.9375	1.50	1.625	1.50	1.65	.65	.65
Boston	1.995*a*	1.75	1.85	1.65	2.00*a*	1.25	1.25
Chicago	2.00	1.95	1.95	1.95	2.00	1.30	1.30
Cincinnati	1.875	1.65	1.775	1.875/2.125	1.875	.95	.95
Cleveland	2.125	2.025	2.125	2.125	2.125	1.375	1.375
Dallas	1.9375	1.425	1.625	1.625	1.75	.80	.80/1.25
Denver	1.98*b*	1.70	1.70*b*	1.70*b*	1.90	1.10	1.10
Detroit	2.00	1.825	2.00	1.85/2.00	2.00	1.275	1.275
Kansas City	2.00	1.75	1.875	1.875	2.00	1.175	.90
Los Angeles	2.00	1.75	2.00	1.65	2.05	1.25	1.25
Minneapolis	1.825	1.65	1.75	1.70	1.90	1.15	1.15
New Orleans	1.625	1.375	1.625	1.55	1.625	.70	.80
New York	2.25*b*	2.10*b*	2.25	2.25*b*	2.25*b*	1.25	1.25
Philadelphia	2.00/2.25	1.775	1.90/2.00	2.25	2.00/2.25	1.025	1.025
Pittsburgh	2.15	2.00	2.00	2.05	2.00	1.15	1.15
St. Louis	2.00	1.95	2.00	2.20	1.90	1.00	1.00
San Francisco	2.05	1.75	2.00	1.85	2.00	1.25	1.25
Seattle	1.975	1.675	1.80	1.90	1.975	1.275	1.30
Montreal*	1.17	1.06	1.11	1.07	1.17	.62	.65



a Correction of rates published in ENR, Dec. 12, 1946. These rates took effect in June, 1946. *b* 7 hr. day. * Cost of living bonus included in basic wage. **ENR Skilled Average:** (Bricklayers, Carpenters, Ironworkers) $1.863. **ENR Common Average:** $1.085.



Want to save labor costs and construction time on paving jobs?

buy American Welded Wire Fabric

● U·S·S American Welded Wire Fabric comes to you already welded, needs no assembling on the job. It lies flat, stays put when concrete is poured and leveled. That means important savings in labor cost and construction time.

This *proven* reinforcement fortifies the concrete slab against stresses and strains in all directions. Its small, evenly spaced members distribute the strength of cold drawn, high yield point *steel* evenly throughout the slab, provide a high degree of crack control.

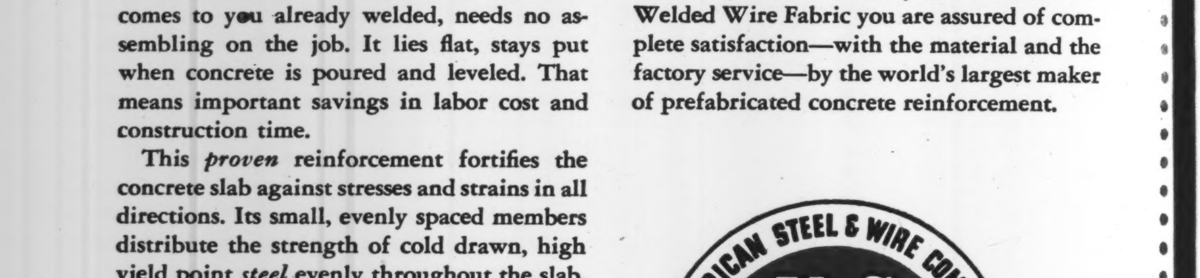
Many prominent engineers and contractors can tell you that when you use American Welded Wire Fabric you are assured of complete satisfaction—with the material and the factory service—by the world's largest maker of prefabricated concrete reinforcement.

American Steel & Wire Company
Cleveland, Chicago and New York
Columbia Steel Company, San Francisco, Pacific Coast Distributors
Tennessee Coal, Iron & Railroad Company, Birmingham, Southern Distributors
United States Steel Export Company, New York

UNITED STATES STEEL

AMERICAN STEEL & WIRE COMPANY
USS
AMERICAN WELDED WIRE FABRIC
UNITED STATES STEEL

Every reinforced concrete paving job will be a better job when you use American Welded Wire Fabric.



Construction Wage Rates and Trends

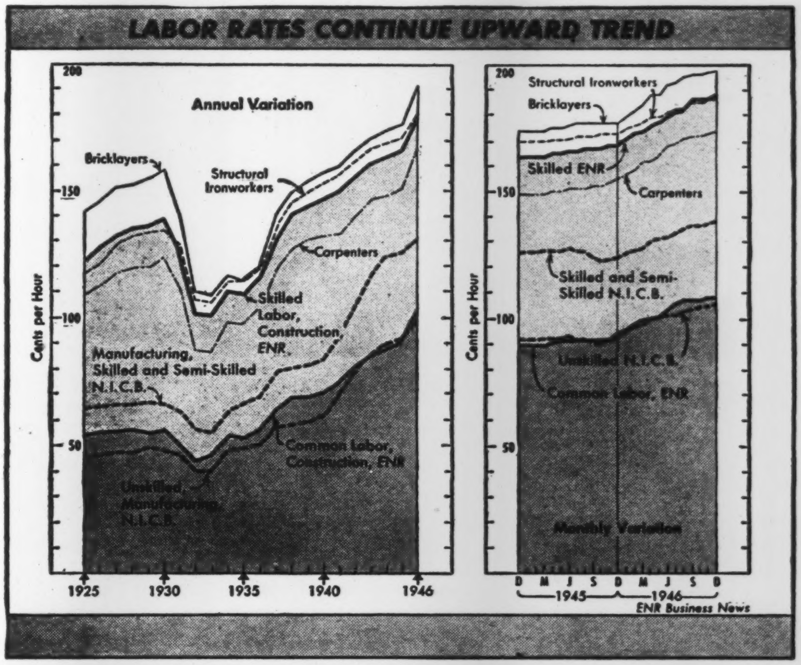
Hourly skilled construction wages rose 8.2 percent over the 1945 average to $1.80 per hour in 1946. Common labor wages rose 13.5 percent in the same period to a new high average of $1.03 per hour. Skilled construction wages rose from $1.68 per hour in December, 1945 to $1.86 per hour in December, 1946, an increase of 10.8 percent, while common labor wages rose from $.938 to $1.085, an increase of 15.7 percent.

Average manufacturing wages, reported by the National Industrial Conference Board, rose 5.8 percent for skilled and semi-skilled workers, while unskilled manufacturing wages rose 10.7 percent. Skilled and semi-skilled manufacturing wages rose from $1.23 per hour in December, 1945 to $1.38 per hour in December, 1946, an increase of 12.2 percent. Unskilled manufacturing wages rose from $.93 to $1.06, or 14.0 percent.

Real income of skilled construction labor, which takes into consideration changes in the cost of living, rose only 0.8 percent in 1946, while real income of common labor rose 5.8 percent. "Real income" is computed by dividing *Engineering News-Record* skilled labor index by the Bureau of Labor Statistics consumers' price index.

B.L.S. CONSUMERS' PRICE INDEX (1935–1939 = 100)

	1941	1942	1943	1944	1945	1946	1947
January	100.8	112.0	120.7	124.2	127.1	129.9	153.1
February	100.8	112.9	121.0	123.8	126.9	129.6	152.8
March	101.2	114.3	122.8	123.8	126.8	130.2	
April	102.2	115.1	124.1	124.6	127.1	130.9	
May	102.9	116.0	125.1	125.1	128.1	131.5	
June	104.6	116.4	124.8	125.4	129.0	133.3	
July	105.3	117.0	123.9	126.1	129.4	141.0	
August	106.2	117.5	123.4	126.4	129.3	143.7	
September	108.1	117.8	123.9	126.5	128.9	145.9	
October	109.3	119.0	124.4	126.5	128.9	148.4	
November	110.2	119.8	124.2	126.6	129.3	151.7	
December	110.5	120.4	124.2	127.0	129.9	153.3	


LABOR RATES CONTINUE UPWARD TREND

ENR Business News

Construction Wages—Rates per Hour

20-CITIES AVERAGE REPORTED BY ENGINEERING NEWS-RECORD

CONSTRUCTION WAGES

	Skilled Aver.†	Common
1910	$0.525	$0.179
1911	.534	.179
1912	.542	.182
1913	.555	.19
1914	.565	.177
1915	.57	.182
1916	.58	.192
1917	.61	.281
1918	.68	.38
1919	.78	.466
1920	1.05	.579
1921	1.06	.54
1922	1.01	.442
1923	1.10	.518
1924	1.19	.555
1925	1.22	.538

SKILLED LABOR †* (Dollars per Hour)

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
J	$1.24	$1.28	$1.34	$1.35	$1.37	$1.37	$1.15	$0.989	$1.054	$1.108	$1.119	$1.22	$1.39	$1.43	$1.47	$1.47	$1.53	$1.61	$1.62	$1.64	$1.70	$1.89
F	1.24	1.32	1.34	1.35	1.38	1.37	1.11	.996	1.062	1.104	1.119	1.24	1.39	1.43	1.47	1.47	1.54	1.61	1.32	1.64	1.73	1.92
M	1.24	1.32	1.34	1.35	1.38	1.36	1.11	.991	1.069	1.092	1.132	1.25	1.40	1.43	1.47	1.47	1.54	1.61	1.62	1.64	1.74	1.92
A	1.25	1.30	1.35	1.35	1.38	1.36	.95	.997	1.084	1.093	1.134	1.26	1.40	1.44	1.47	1.48	1.54	1.61	1.63	1.65	1.76	1.94
M	1.26	1.31	1.36	1.35	1.38	1.36	.96	.998	1.101	1.081	1.138	1.30	1.40	1.44	1.47	1.49	1.54	1.61	1.63	1.65	1.77	....
J	1.27	1.33	1.35	1.36	1.38	1.32	.99	.994	1.101	1.074	1.138	1.33	1.41	1.44	1.47	1.49	1.55	1.61	1.64	1.66	1.80	....
J	1.27	1.33	1.35	1.36	1.38	1.23	1.00	.985	1.104	1.077	1.159	1.35	1.43	1.44	1.48	1.50	1.56	1.62	1.64	1.66	1.82	....
A	1.28	1.34	1.35	1.37	1.39	1.19	.98	.986	1.110	1.088	1.159	1.37	1.43	1.44	1.48	1.50	1.59	1.62	1.64	1.67	1.83	....
S	1.28	1.34	1.35	1.37	1.39	1.19	.99	1.016	1.119	1.088	1.159	1.37	1.43	1.44	1.48	1.52	1.59	1.62	1.64	1.67	1.85	....
O	1.29	1.33	1.35	1.37	1.39	1.17	.98	1.029	1.120	1.104	1.176	1.38	1.43	1.44	1.48	1.52	1.59	1.62	1.64	1.67	1.85	....
N	1.29	1.34	1.35	1.37	1.39	1.16	.97	1.037	1.120	1.101	1.178	1.38	1.43	1.46	1.48	1.52	1.60	1.62	1.64	1.68	1.86	....
D	1.29	1.33	1.85	1.37	1.39	1.15	.98	1.062	1.120	1.101	1.180	1.39	1.43	1.46	1.48	1.52	1.60	1.62	1.64	1.68	1.87	....
Av.	1.27	1.32	1.35	1.36	1.38	1.27	1.02	1.006	1.097	1.093	1.149	1.32	1.41	1.44	1.47	1.50	1.56	1.615	1.634	1.66	1.80	....
M1	.651	.656	.659	.668	.662	.634	.559	.55	.642	.662	.685	.78	.80	.81	.83	.916	1.044	1.163	1.227	1.248	1.321	....

COMMON LABOR * (Dollars per Hour)

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
J	.54	.55¼	.55	.559	.5628	.5384	.4524	.4271	.5158	.5376	.547	.603	.680	.682	.685	.711	.776	.832	.869	.891	.952	1.109
F	.54	.55¾	.54¾	.564	.5628	.5428	.4521	.4285	.5268	.5241	.547	.603	.675	.680	.685	.713	.780	.832	.869	.891	.968	1.123
M	.54¼	.56	.54¾	.5509	.5610	.5371	.4358	.4272	.5268	.5243	.547	.612	.675	.680	.685	.716	.780	.842	.870	.895	.988	1.123
A	.54¼	.56	.55	.529	.5646	.5359	.4122	.4343	.5343	.5255	.552	.612	.677	.683	.685	.725	.788	.858	.874	.904	1.004	1.138
M	.55	.55½	.55	.5315	.5628	.5394	.4105	.4442	.5343	.5233	.558	.627	.673	.682	.690	.741	.788	.863	.874	.909	1.018	....
J	.55	.55½	.55½	.534	.5628	.5394	.4121	.4393	.5343	.5269	.564	.644	.677	.684	.703	.747	.796	.863	.877	.916	1.034	....
J	.55¼	.55½	.55¾	.5296	.5615	.4721	.4114	.4430	.5300	.5289	.563	.662	.677	.684	.707	.753	.803	.863	.882	.916	1.058	....
A	.55½	.55½	.5607	.5353	.5615	.4634	.4220	.4430	.5300	.5285	.569	.668	.677	.685	.707	.753	.823	.869	.882	.916	1.071	....
S	.55½	.55½	.5607	.5496	.5609	.4665	.4308	.4524	.5349	.5285	.569	.673	.677	.685	.711	.761	.823	.869	.883	.917	1.072	....
O	.55	.54½	.5628	.5496	.5596	.4584	.4308	.5057	.5363	.5285	.583	.676	.682	.685	.711	.761	.826	.869	.886	.917	1.073	....
N	.55½	.54½	.5653	.5603	.5587	.4559	.4260	.5102	.5388	.5275	.583	.678	.682	.685	.711	.768	.832	.869	.886	.917	1.078	....
D	.55½	.55	.5628	.5653	.5503	.4534	.4273	.5202	.5413	.5275	.586	.678	.682	.685	.711	.769	.832	.869	.890	.938	1.085	....
Av.	.548	.554	.5558	.5465	.5607	.5002	.4269	.4562	.5319	.5276	.564	.645	.678	.683	.699	.743	.804	.853	.879	.910	1.033	....
M2	.461	.472	.474	.486	.478	.461	.401	.401	.478	.494	.498	.568	.584	.594	.61	.682	.774	.854	.892	.917	1.015	....

Notes:

† *ENR* Skilled Average represents rates for bricklayers, carpenters, ironworkers.

M1 Skilled and Semi-skilled Manufacturing.

M2 Unskilled Mfg.

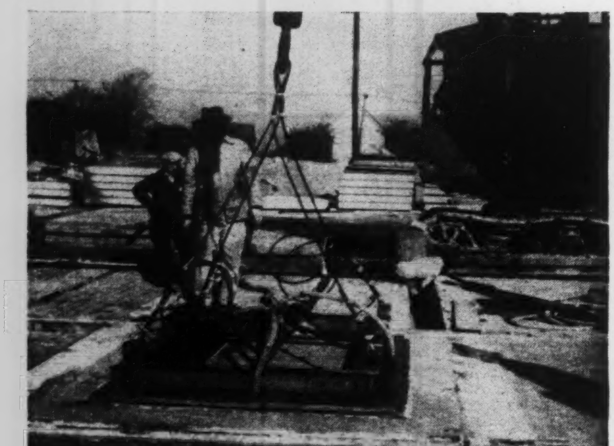
Both represent earnings per hour as reported by N. I. C. B.

* Checked monthly. Reported in first issue of *ENR* each month.

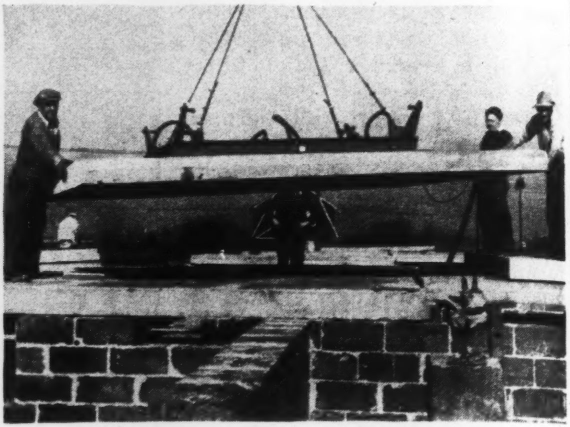
HERE'S HOW

The Vacuum Concrete Precast System "Works"

(TO HELP MEET A NATIONWIDE BUILDING NEED!)



1. Three on-the-spot action pictures show Vacuum Concrete's modern system of precasting concrete floors for an apartment development, Parkway Village, Flushing, N. Y. In a convenient area at the site, a Vacuum lifter is preparing to strip Vacuum Concrete casting from the mold.



2. Here the concrete slab is being guided into place, to become part of an economical floor system, *durable, strong* and *crack free.*

3. Only a matter of a few hours have passed since pouring, and after 28 days it will have *double the strength of ordinary concrete!*

Whether you are laying floors, foundations, walls or flat roofs—the Vacuum Concrete system makes it possible for you to build *faster* and *cheaper.*

The system is this easy: we furnish *all* special machinery and equipment, along with consulting engineering service and field supervision.

Vacuum Processed Concrete is being used today for all load carrying parts and for exterior wall surfaces. It reduces the water in the mix, cuts shrinkage to a minimum, and concrete members can be permanently installed 24 hours after pouring!

We invite you to write us today for details.

Vacuum is also being used for a project of 580 individual units in the city of Philadelphia—added proof of the value and acceptance of the Vacuum Concrete Precast System in today's building picture.

VACUUM CONCRETE INC.

4200 SANSOM STREET ★ PHILADELPHIA 4, PENNA.

Yearly Average WAGES OF SIX BUILDING TRADES in Seven Cities

Bricklayers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913......	$0.65	$0.70	$0.75	$0.70	$0.70	$0.875	$0.75
1914-15...	.65	.75	.75	.70	.75	.875	.75
1916......	.65	.75	.75	.70	.75	.875	.75
1917......	.70	.75	.75	.70	.75	.875	.81
1918......	.80	.81	.75	.875	.85	1.00	1.00
1919......	.80	.875	.875	.875	1.00	1.125	1.125
1920......	1.00	1.25	1.25	1.00	1.25	1.25	1.25
1921......	1.00	1.25	1.25	1.00	1.25	1.25	1.125
1922......	1.00	1.25	1.10	1.00	1.25	1.25	1.125
1923......	1.25	1.50	1.10	1.125	1.50	1.375	1.25
1924......	1.25	1.50	1.35	1.125	1.75	1.25	1.25
1925......	1.25	1.50	1.50	1.25	1.75	1.25	1.35
1926......	1.35	1.645	1.56	1.25	1.75	1.25	1.375
1927......	1.40	1.75	1.625	1.25	1.75	1.375	1.375
1928......	1.42	1.75	1.625	1.45	1.75	1.375	1.4275
1929......	1.50	1.84	1.65	1.50	1.75	1.375	1.50
1930......	1.50	1.925	1.70	1.50	1.75	1.375	1.50
1931......	1.50	1.7125	1.70	.8125	1.75	1.375	1.1875
1932......	1.105	1.47	1.40	.825	1.50	1.175	.975
1933......	1.10	1.575	1.406	.812	1.50	1.125	1.01
1934......	1.12	1.53	1.50	1.00	1.50	1.50	1.30
1935......	1.20	1.50	1.50	1.00	1.50	1.50	1.00
1936......	1.28	1.50	1.50	1.00	1.50	1.50	1.00
1937......	1.50	1.725	1.62	1.33	1.50	1.60	1.54
1938......	1.50	1.886	1.70	1.50	1.50	1.75	1.60
1939......	1.50	1.893	1.70	1.50	1.50	1.75	1.60
1940......	1.50	1.96	1.70	1.49	1.50	1.75	1.60
1941......	1.50	2.00	1.70	1.448	1.396	1.75	1.6375
1942......	1.573	2.00	1.721	1.75	1.563	1.771	1.715
1943......	1.625	2.00	1.75	1.75	1.75	1.802	1.764
1944......	1.625	2.00	1.75	1.75	1.75	1.875	1.829
1945......	1.625	2.00	1.84	1.75	1.84	1.875	1.845
1946......	1.8825	2,25	1.9583	1.8906	1.975	2.0063	1.9371

Common Building Laborers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913......	$0.35	$0.375	$0.40	......	$0.4875	$0.50	......
1914-15...	.35	.375	.40	......	.4875	.50	......
1916......	.35	.375	.425	......	.4875	.50	......
1917......	.40	.425	.45	......	.4875	.50	......
1918......	.425	.47	.50	......	.51	.625	......
1919......	.50	.575	.575	......	.6375	.75	......
1920......	.70	.775	1.00	......	.70	.93	......
1921......	.70	.875	1.00	......	.85	1.00	$0.875
1922......	.70	.875	.725	......	.85	.71	.875
1923......	.70	.95	.725	......	1.00	.77	.93
1924......	.82	1.00	.725	$0.385	1.20	.8125	.95
1925......	.7625	1.00	.825	.6075	1.20	.8125	1.00
1926......	.77	1.07	.88	.625	1.20	.8125	1.00
1927......	.79	1.125	.925	.625	1.20	.875	1.00
1928......	.805	1.125	.93125	.52	1.20	.875	1.00
1929......	.85	1.15	.93	.50	1.20	.875	1.00
1930......	.85	1.03125	.975	.50	1.20	.875	1.00
1931......	.85	1.025	.975	.35	.875	.875	.70
1932......	.70	1.00	.825	.40	1.00	.70	.80
1933......	.70	.91	......	......	1.00	.70	.80
1934......	.70	.825	.825	......	.875	.70	1.00
1935......	.70	.825	.825	......	.875	.70	1.00
1936......	.77	.825	.95	.30-.40	.875	1.00	1.00
1937......	.85	1.14	1.025	.40	1.00	1.10	1.15
1938......	.85	1.14	1.025	.40	1.00	1.25	1.15
1939......	.85	1.14	1.025	.40	1.00	1.25	1.15
1940......	.85	1.186	1.025	.40	1.00	1.25	1.15
1941......	.85	1.214	1.025	.4583	1.00	1.25	1.15
1942......	1.00	1.214	1.063	.65	1.075	1.25	1.265
1943......	1.00	1.214	1.063	.65	1.15	1.40	1.33
1944......	1.00	1.214	1.10	.65	1.15	1.40	1.395
1945......	1.028	1.215	1.215	.641	1.056	1.072	1.172
1946......	1.1667	1.2333	1.25	.65	1.00	1.1406	1.2371

Carpenters

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913......	$0.50	$0.625	$0.65	$0.525	$0.625	$0.625	$0.56
1914-15...	.55	.625	.65	.45	.625	.625	.56
1916......	.57	.625	.70	.45	.625	.625	.56
1917......	.60	.69	.70	.45	.65	.68	.65
1918......	.65	.69	.70	.55	.70	.75	.825
1919......	.75	.75	.80	.65	.825	.875	.93
1920......	1.00	1.125	1.25	.75	1.00	1.06	1.00
1921......	1.00	1.125	1.25	.75	1.25	1.125	.875
1922......	1.00	1.125	1.10	.75	1.10	1.04	.875
1923......	1.05	1.125	1.25	.75	1.25	1.04	1.00
1924......	1.05	1.3125	1.17	.76	1.525	1.00	1.00
1925......	1.0875	1.3125	1.3475	.6025	1.50	1.00	1.0825
1926......	1.20	1.45	1.39	.6575	1.50	1.00	1.125
1927......	1.25	1.50	1.30	.95	1.50	1.125	1.125
1928......	1.279	1.50	1.50	1.00	1.50	1.125	1.125
1929......	1.38	1.55	1.47	1.00	1.50	1.125	1.125
1930......	1.375	1.65	1.625	1.00	1.50	1.125	1.125
1931......	1.175	1.45	1.625	.60	1.50	1.125	.875
1932......	1.04	1.33	1.40	.60	1.275	.96	.695
1933......	1.065	1.375	1.3125	.60	1.25	.90	.73
1934......	.9375	1.40	1.3125	1.00	1.25	1.05	.83
1935......	.9275	1.40	1.3156	1.00	1.25	1.10	1.00
1936......	.937	1.40	1.50	.88	1.25	1.12	1.00
1937......	1.14	1.60	1.57	1.06	1.35	1.31	1.23
1938......	1.343	1.75	1.625	1.125	1.25	1.25	1.25
1939......	1.375	1.75	1.625	1.125	1.25	1.25	1.25
1940......	1.375	1.81	1.625	1.125	1.333	1.25	1.25
1941......	1.24	1.85	1.625	1.099	1.333	1.291	1.325
1942......	1.417	1.85	1.656	1.167	1.50	1.385	1.415
1943......	1.50	1.85	1.70	1.219	1.50	1.479	1.464
1944......	1.50	1.85	1.70	1.25	1.50	1.50	1.544
1945......	1.50	1.85	1.756	1.281	1.62	1.50	1.55
1946......	1.625	2.10	1.9083	1.4479	1.8667	1.7083	1.6371

Plasterers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913......	$0.65	$0.69	$0.75	......	$0.75	$0.875	$0.75
1914-15...	.65	.69	.75	......	.75	.875	.75
1916......	.70	.75	.75	......	.75	.875	.75
1917......	.70	.75	.75	......	.75	.875	.875
1918......	.70	.75	.81	......	.875	1.00	1.00
1919......	.80	.90	.875	......	1.00	1.125	1.125
1920......	1.00	1.25	1.25	......	1.25	1.25	1.25
1921......	1.25	1.25	1.25	......	1.375	1.375	1.25
1922......	1.125	1.25	1.10	......	1.375	1.275	1.125
1923......	1.125	1.25	1.50	......	1.50	1.275	1.25
1924......	1.25	1.50	1.50	......	1.75	1.275	1.375
1925......	1.25	1.50	1.50	......	1.75	1.50	1.375
1926......	1.50	1.75	1.50	......	1.75	1.50	1.375
1927......	1.50	1.75	1.625	......	1.75	1.50	1.375
1928......	1.50	1.75	1.625	......	1.75	1.50	1.50
1929......	1.50	1.75	1.625	......	1.75	1.375	1.50
1930......	1.625	1.925	1.70	......	1.75	1.375	1.50
1931......	1.50	1.7125	1.70	$1.00	1.75	1.375	1.1875
1932......	1.625	1.50	1.375	1.25	1.50	1.10	1.20
1933......	1.375	1.50	1.375	......	1.50	1.10	1.20
1934......	1.231	1.50	1.50	1.00	1.50	1.38	1.18
1935......	1.375	1.50	1.50	1.00	1.50	1.25	1.375
1936......	1.375	1.50	1.50	1.00	1.50	1.35	1.25
1937......	1.625	1.80	1.62	1.00	1.51	1.51	1.54
1938......	1.625	2.00	1.70	1.00	1.58	1.65	1.60
1939......	1.625	2.00	1.70	1.00	1.58	1.60	1.60
1940......	1.625	2.00	1.70	1.00	1.722	1.60	1.60
1941......	1.625	2.00	1.70	1.271	1.75	1.639	1.6375
1942......	1.65	2.00	1.825	1.50	1.75	1.681	1.715
1943......	1.667	2.00	1.825	1.50	1.75	1.75	1.764
1944......	1.667	2.00	1.825	1.50	1.75	1.75	1.844
1945......	1.667	2.00	1.844	1.61	1.75	1.75	1.850
1946......	1.8611	2.1875	1.95	1.65	1.90	1.9375	1.9371

Structural Ironworkers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913......	$0.625	$0.625	$0.68	$0.625	$0.65	$0.75	$0.625
1914-15...	.625	.625	.68	.625	.65	.75	.625
1916......	.625	.66	.68	.625	.675	.75	.625
1917......	.68	.68	.69	.625	.70	.75	.75
1918......	.80	.80	.70	.75	.80	.875	.875
1919......	.80	.875	.875	.80	.925	1.00	1.00
1920......	1.00	1.125	1.25	1.00	1.25	1.125	1.125
1921......	1.00	1.125	1.25	......	1.25	1.25	1.125
1922......	1.00	1.125	1.05	......	1.06	1.125	1.00
1923......	1.05	1.125	1.05	1.05	1.25	1.125	1.125
1924......	1.16	1.29	1.25	1.00	1.45	1.125	1.125
1925......	1.1375	1.4675	1.36	1.135	1.50	1.125	1.125
1926......	1.23	1.60	1.405	1.25	1.50	1.125	1.125
1927......	1.25	1.75	1.50	1.55	1.50	1.375	1.155
1928......	1.3125	1.75	1.50	1.75	1.50	1.375	1.215
1929......	1.375	1.81	1.57	1.63	1.57	1.375	1.25
1930......	1.375	1.925	1.625	1.25	1.75	1.375	1.25
1931......	1.375	1.925	1.625	.75	1.75	1.375	1.1875
1932......	1.205	1.675	1.375	.75	1.50	1.13	1.13
1933......	1.14	1.65	1.35	.75	1.47	1.20	1.10
1934......	1.20	1.62	1.35	1.00	1.47	1.375	1.13
1935......	1.20	1.65	1.35	1.125	1.47	1.375	1.23
1936......	1.20	1.58	1.50	1.10	1.47	1.375	1.25
1937......	1.375	1.79	1.58	1.25	1.73	1.44	1.39
1938......	1.479	1.925	1.70	1.25	1.75	1.50	1.50
1939......	1.60	1.925	1.70	1.25	1.75	1.50	1.50
1940......	1.5625	1.9625	1.70	1.302	1.75	1.60	1.50
1941......	1.50	2.00	1.70	1.469	1.75	1.60	1.5375
1942......	1.588	2.00	1.725	1.50	1.75	1.625	1.615
1943......	1.65	2.00	1.76	1.50	1.75	1.75	1.664
1944......	1.65	2.00	1.76	1.50	1.75	1.75	1.729
1945......	1.666	2.00	1.805	1.594	1.79	1.75	1.745
1946......	1.7875	2.25	1.9033	1.625	1.9708	1.875	1.7954

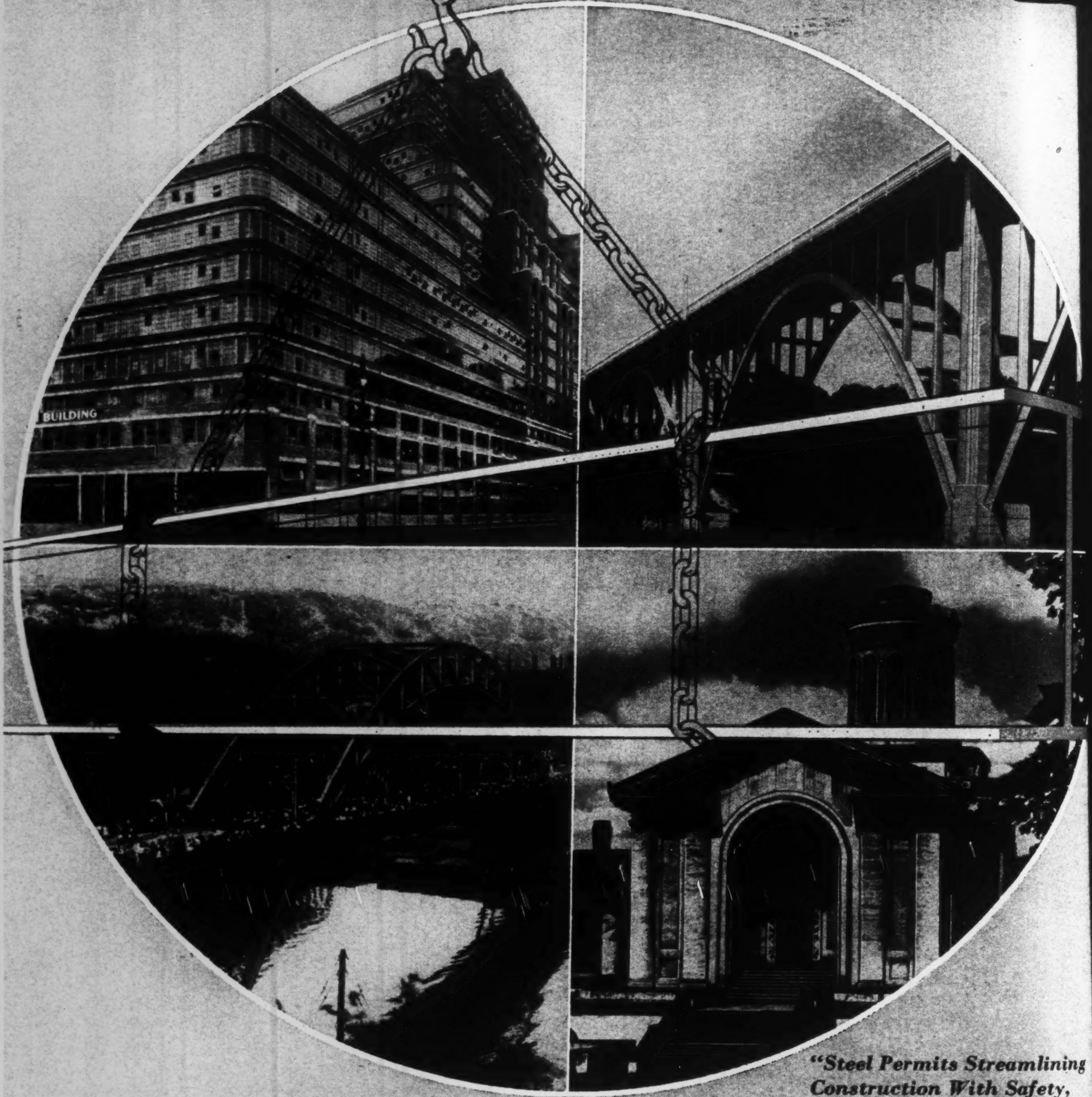
Common Laborers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913......	$0.35	$0.225	$0.40	......	$0.25	$0.27	$0.375
1914-15...	.35	.225	.40	......	.25	.31	.375
1916......	.35	.25	.425	......	.25	.31	.375
1917......	.375	.30	.45	......	.30	.375	.4375
1918......	.40	.405	.50	......	.365	.43	.56
1919......	.40	.405	.575	......	.425	.625	.6875
1920......	.6875	.75	1.00	......	.6075	.75	.75
1921......	.6875	.60	1.00	......	.6075	.81	.75
1922......	.6875	.60	.725	......	.5575	.625	.625
1923......	.6875	.615	.725	......	.6075	.625	.625
1924......	.6625	.6875	.8175	$0.335	.70	.525	.625
1925......	.6025	.6525	.8175	.31	.6525	.525	.5625
1926......	.615	.815	.86	.30	.6525	.525	.5675
1927......	.595	.90625	.8875	.325	.5875	.55	.64
1928......	.6025	.90625	.90	.325	.60	.55	.678
1929......	.625	.985	.92	.29	.61	.57	.70
1930......	.625	1.03125	.975	.275	.6375	.6875	.70
1931......	.60	.65625	.7375	.20	.6125	.59375	.60
1932......	.575	.645	.665	.225	.56	.56	.48
1933......	.548	.725	.784	.248	.6223	.64	.48
1934......	.55	.8475	.825	.30	.7875	.64	.53
1935......	.575	.68	.825	.30	.7875	.625	.60
1936......	.581	.65	.95	.35	.7875	.651	.60
1937......	.725	.91	.99	.35	.86	.75	.87
1938......	.735	.912	1.025	.35	.663	.65	1.00
1939......	.725	.912	1.025	.35	.663	.65	.908
1940......	.725	.912	1.025	.35	.804	.745	.90
1941......	.7875	.934	1.025	.4167	.875	.842	.975
1942......	.879	.991	1.056	.6375	.8875	.8875	1.058
1943......	.90	.991	1.10	.65	.95	.95	1.082
1944......	.95	1.0213	1.10	.65	.9625	.9875	1.118
1945......	1.00	1.06	1.16	.65	1.00	1.00	1.145
1946......	1.1667	1.2042	1.25	.65	1.00	1.1406	1.2433

Always

You can ^ depend on FORT PITT BRIDG

to deliver the steel . . . ACCURATE AND ON TI



"Steel Permits Streamlining Construction With Safety, Endurance and Economy."

Fort Pitt Bridge makes no ill-advised promises—*delivery dates, product quality, accuracy* and *dependability* have built an enviable reputation with users of structural steel for more than fifty years. *Bring your difficult fabricated steel problems to Fort Pitt Bridge.*

FORT PITT BRIDGE WORKS

Member American Institute of Steel Construction

General Offices, PITTSBURGH, PA. . . . Plant at CANONSBURG, PA.

BRANCH OFFICES

New York, N. Y. 441 Lexington Avenue
Columbus, Ohio . Huntington Bank Bldg.
Cleveland, Ohio . . Bulkley Building
Detroit, Michigan . New Center Bldg.
Philadelphia, Pa. Commercial Trust Bldg.

Building Trades Wage Rates—8-Hour Day

(Prevailing March 1, 1947.—Compiled by Engineering News-Record)

City and State	Carpenters	Bricklayers	Structural Ironworkers	Common Labor—Buildings	Common Labor—Heavy Constr.	Stonemasons	Mason's Helpers	Plasterers	Mosaic and Terrazzo	Tile Layers	Cement Finishers	Lathers	Electric Workers (Inside)	Painters	Glaziers	Plumbers	Steamfitters	Roofers	Waterproofers	Sheet Metal Workers	Welders	Hoisting Eng.—1-Drum	Hoisting Eng.—2-Drum	Tractor Operator (Over 30-hp.)	Power Shovel Operator	Truck Drivers (Over 1½ Tons)
Anderson, Ind.	$1.63	$1.88	$1.88	$1.05	$1.25	$1.88	$1.18	$1.88	.....	....	$1.75	$1.63	$1.75	[1]$1.50	$1.50	$1.75	$1.75	.....	.....	.....	.....	$1.75	$1.85	$1.85	$1.85	$1.25
Atlanta, Ga.	1.50	2.00	1.75	.75	.85	2.00	.85	2.00	$2.00	$2.00	2.00	2.00	1.80	1.40	1.40	2.00	1.75	$1.50	$1.50	$1.40	$1.75	1.50	1.75	1.68	1.68	1.00
Austin, Tex.	1.50	2.25	1.75	.50	[a].65	2.25	.65	1.75	2.25	2.25	1.50	1.50	1.88	[b]1.62	1.13	1.88	1.88	1.25	.....	1.50	1.75	1.25	1.50	[2]1.50	1.50	[c]1.00
Baltimore, Md.	1.78	[18]2.25	2.15	.95	.95	[18]2.25	1.05	1.90	1.75	1.75	1.90	1.88	1.85	1.50	1.60	1.85	1.85	1.50	1.50	1.85	[3].....	1.03	2.00	1.50	2.00	1.25
Baton Rouge, La.	1.50	2.00	1.75	.80	.80	2.00	.95	2.00	2.00	2.00	2.00	2.00	1.88	1.50	1.50	2.00	2.00	1.45	1.45	1.60	[3].....	1.50	1.75	1.50	1.75	1.10
Birmingham, Ala.	1.50	2.00	1.75	.75	[d]1.25	2.00	[d]1.25	1.88	2.00	1.75	1.75	1.63	2.00	[e]1.88	1.50	2.00	2.00	[f]1.45	[f]1.45	1.60	.....	1.50	1.75	1.75	1.75	[g]1.75
Bismarck, N. D.	1.45	1.75	1.50	.90	.90	1.75	.90	1.50	.....	1.75	1.50	1.25	1.40	1.35	1.25	1.40	1.40	.....	.....	1.25	1.25	.....	.....	1.25	1.25	.90
Boise, Idaho	1.50	.....	1.73	1.00	1.00	.....	1.25	1.70	.....	....	1.50	1.70	1.75	1.50	1.50	1.75	1.75	1.30	.....	1.40	1.60	1.50	.....	[h]1.60	2.00	1.13
Boston, Mass.	1.75	2.00	1.90	1.25	1.25	2.00	1.25	2.00	2.00	2.00	1.88	2.00	1.90	1.63	1.70	1.90	1.90	1.82	2.00	1.90	1.95	1.80	.....	1.80	2.18	1.10
Buffalo, N. Y.	1.85	2.08	2.00	1.25	1.25	2.00	1.25	2.00	1.73	1.73	1.83	2.00	2.00	1.75	1.75	2.00	2.00	1.90	1.75	1.85	2.00	1.84	1.84	2.00	2.00	1.25
Burlington, Vt.	1.35	1.63	[i]1.10	.85	.85	1.63	.85	1.63	1.63	1.63	1.63	.....	1.38	1.25	[d]1.25	[j]1.50	[j]1.50	1.63	.....	[k]1.75	[l]1.35	.....	.....	1.50	1.50	.85
Charleston, S. C.	1.38	1.75	1.50	.75	.75	1.75	1.00	1.50	1.50	1.50	1.50	1.00	1.50	1.50	1.50	2.00	2.00	1.50	.....	1.50	.....	1.25	1.50	....	1.50	.75
Charleston, W. Va.	1.73	2.00	1.88	1.00	1.00	2.00	1.15	1.73	1.75	1.75	1.50	1.59	1.88	1.60	1.50	1.85	1.85	1.38	1.38	1.56	1.88	1.80	1.80	1.55	1.80	[34]1.25
Charlotte, N. C.	1.25	1.63	1.50	.70	.70	2.00	.....	1.75	1.75	1.75	1.38	[4]1.75	1.38	1.50	[6]1.13	2.00	2.00	1.25	[3].....	1.50	[3].....	1.25	[7]1.50	[8]1.25	1.50	1.00
Cheyenne, Wyo.	1.50	1.85	1.50	[m].90	[m].90	.....	.....	1.85	1.50	[n]1.75	1.50	1.50	1.63	1.50	1.50	1.58	1.58	1.50	.....	1.63	1.50	1.50	[o]1.70	1.70	1.70	[d]1.25
Chicago, Ill.	1.95	2.00	2.00	1.30	1.30	2.00	1.30	2.00	[9]1.95	1.95	1.95	2.00	2.15	1.95	2.13	2.15	1.95	2.00	2.00	1.95	2.00	1.95	1.95	1.65	2.25	[10]1.30
Cincinnati, Ohio	1.80	2.00	[11]1.93	.....	.....	2.00	1.30	2.13	1.75	1.75	1.68	1.78	2.00	1.70	1.90	1.90	1.90	[12]1.75	.....	1.73	.....	.....	[v]2.25	....	.....	....
Columbus, Ohio	1.75	2.00	1.88	1.00	1.00	2.00	1.15	1.93	1.25	1.63	1.63	1.88	1.75	1.55	1.38	1.75	1.75	1.50	1.50	1.73	1.88	1.63	1.75	1.43	2.00	.75
Concord, N. H.	1.38	1.75	1.80	.90	.90	1.75	1.05	1.75	1.73	1.73	1.75	1.50	1.50	1.15	1.15	1.50	1.50	1.25	.....	1.50	.....	[13]1.50	[14]1.90	1.50	1.90	1.05
Conway, Ark.	[d]1.25	1.88	.....	[15].65	[16].75	1.50	.75	1.50	.....	[17]1.50	[d]1.25	1.50	1.88	1.50	.....	1.50	1.50	.....	.....	1.50	1.25	.....	.....	....	.....	....
Dallas, Tex.	1.63	2.00	1.75	.90	[p]1.25	2.00	[q]1.90	1.88	1.88	1.13	1.65	1.88	1.88	1.63	1.50	1.88	1.88	1.40	1.40	1.75	1.88	1.50	1.75	1.75	1.75	1.13
Denver, Colo.	1.70	1.98	1.70	1.10	1.10	1.98	1.35	1.90	[18]1.90	1.90	1.70	1.90	1.85	1.60	[19]1.45	1.85	1.85	1.70	1.70	1.70	1.85	1.70	1.83	1.70	1.83	1.35
Des Moines, Iowa	1.60	2.00	1.70	1.05	1.05	2.00	1.15	1.75	1.60	1.60	1.60	1.75	1.75	1.63	1.38	1.88	1.88	1.15	.....	1.63	.....	1.55	1.70	....	1.70	[20]1.10
Detroit, Mich.	1.83	2.00	2.00	1.28	1.28	2.00	1.28	2.00	1.88	1.88	1.73	2.00	2.13	1.75	1.61	2.00	2.00	1.88	1.73	1.88	[3].....	1.85	1.85	1.85	1.85	1.30
Duluth, Minn.	[5]1.50	[5]1.75	[5]1.75	[5]1.00	[5]1.10	[5]1.75	[5]1.10	[5]1.73	[5]1.75	[5, 21]1.63	[5]1.33	[5]1.73	[5]1.68	[5]1.50	[5]1.20	[5]1.55	[5]1.55	[5]1.45	[5]1.25	[5]1.55	[5r]1.75	[5]1.70	[5]1.80	[2, 5]1.70	[5]1.85	[5]1.10
Fort Worth, Tex.	1.63	2.06	1.68	.80	.80	2.06	.85	2.00	1.50	1.50	1.75	2.00	1.50	1.75	1.38	1.75	1.75	1.50	1.50	1.50	1.25	1.63	1.75	1.50	1.50	.85
Harrisburg, Pa.	1.38	1.75	1.88	1.00	1.00	1.75	1.13	1.63	1.88	1.47	1.63	1.63	1.70	1.30	1.30	1.70	1.70	1.23	1.23	1.50	1.87	2.13	2.13	[23]1.90	2.25	1.00
Indianapolis, Ind.	1.68	1.98	1.88	1.10	1.10	1.98	1.33	1.95	1.75	1.75	1.58	1.83	1.85	1.63	1.63	1.85	1.85	1.35	1.58	1.70	.....	1.90	1.90	1.15	1.90	1.15
Jackson, Miss.	1.50	1.88	1.75	.70	.80	2.00	.80	1.75	1.88	1.88	1.75	1.25	1.50	1.25	1.25	1.75	1.75	1.50	1.15	1.25	1.50	1.50	1.25	1.50	1.25	1.00
Jacksonville, Fla.	1.50	2.00	1.75	.75	.75	2.00	.80	2.00	1.75	1.75	1.63	.....	1.75	1.88	1.38	2.00	2.00	1.25	.....	1.50	1.25	.....	.....	1.75	1.75	.90
Jefferson City, Mo.	1.63	2.00	2.00	1.00	1.00	1.50	1.15	.....	.....	....	1.50	2.05	1.75	1.37	1.38	1.75	1.75	1.63	.....	1.35	2.00	1.65	2.20	2.00	2.00	1.15
Kansas City, Mo.	1.75	2.00	1.88	1.18	1.18	1.75	.....	2.00	1.78	1.78	1.75	1.80	1.88	1.70	1.88	1.88	1.88	1.60	1.60	1.88	[3].....	1.75	1.88	1.25	1.88	[s]1.35
Little Rock, Ark.	1.50	2.00	1.88	.75	.75	2.00	1.13	2.00	2.00	2.00	2.00	1.75	1.63	1.38	1.35	1.75	1.75	1.75	1.50	1.38	1.75	1.38	1.63	1.38	1.75	1.00
Los Angeles, Calif.	1.65	2.00	1.90	1.15	1.15	2.00	1.38	2.00	1.80	1.80	1.78	1.90	2.00	1.50	1.62	2.00	2.00	1.75	1.38	1.75	[3].....	1.83	1.83	1.70	1.90	1.38
Meridian, Miss.	1.50	2.00	2.00	.65	.75	2.00	.75	1.75	1.88	1.88	1.75	1.25	1.50	1.25	1.25	1.75	1.75	1.50	1.15	1.25	1.50	1.50	1.25	1.50	1.25	1.00
Milwaukee, Wis.	1.60	1.83	1.58	1.20	1.30	1.83	1.30	1.75	1.68	1.75	1.60	1.75	1.85	1.50	1.65	1.85	1.85	1.55	1.55	1.65	1.58	1.70	1.70	1.65	2.00	1.20
Minneapolis, Minn.	1.65	1.83	1.75	1.15	1.15	1.83	1.25	1.90	1.70	1.70	1.83	1.90	1.85	1.65	1.55	1.75	1.75	1.58	1.58	1.75	[3].....	1.70	1.70	[2, 28]1.70	1.85	[29]1.30
New Orleans, La.	1.50	1.94	1.88	.80	.80	1.94	.90	1.88	.....	....	1.50	2.00	1.75	1.25	1.50	1.88	1.88	1.45	1.45	1.60	1.60	1.50	1.75	1.75	1.75	.85
New York, N. Y.	2.50	[18]2.50	2.50	1.25	1.20	[18]2.25	[18]1.50	[22]2.50	2.50	2.00	[18]2.10	[18]2.10	[22]2.25	[18]2.00	2.50	[22]2.00	[18]2.30	2.50	2.50	[18]2.30	[3].....	.....	.....	....	.....	....
Norfolk, Va.	1.50	2.00	1.75	[27].65	[27].65	2.00	[27z]1.00	1.88	1.63	1.63	1.50	1.88	1.81	1.38	1.38	1.75	1.75	[12]1.25	[3].....	1.40	[3].....	1.38	1.63	[26]1.50	1.63	.75
Oklahoma City, Ok.	1.68	1.94	1.68	.98	.85	[18]1.94	[18]1.13	[18]2.25	2.00	2.00	1.90	[18]2.10	1.88	[18]1.63	[18]1.25	1.88	1.88	1.25	1.25	1.50	1.60	1.38	1.50	1.25	1.63	.98
Omaha, Nebr.	1.63	1.83	1.75	.93	.93	1.83	.93	1.75	1.65	1.83	1.63	1.70	1.83	1.38	1.40	1.75	1.75	1.38	1.38	1.50	1.75	1.50	1.50	1.75	1.75	[aa]1.05
Philadelphia, Pa.	1.78	[v]2.25	[w]2.00	1.03	1.03	1.88	1.40	[v]2.25	1.88	1.88	1.75	1.03	2.25	[e]1.88	1.75	2.00	2.00	[y]2.00	[y]2.00	2.00	[3].....	2.25	2.25	1.75	2.25	1.00
Pierre, S. D.	1.25	1.50	.....	.75	[c]1.00	.....	.....	.....	.....	....	.....	.....	.....	1.25	.....	1.50	1.50	.....	.....	1.25	.....	.....	.....	1.25	1.35	.75
Pittsburgh, Pa.	2.00	2.15	2.00	1.15	1.15	2.00	1.40	2.00	1.75	1.75	2.00	2.00	2.00	1.85	1.83	2.00	2.00	1.80	1.80	1.88	2.00	2.05	2.15	2.15	2.15	....
Portland, Ore.	1.75	2.10	1.95	1.35	1.35	.....	1.60	2.10	.....	2.00	1.83	2.00	1.88	1.75	1.78	2.13	2.13	1.80	1.80	1.83	.....	1.80	2.05	1.75	2.00	1.35
Raleigh, N. C.	1.50	1.75	1.50	.75	.85	1.75	.75	1.50	1.50	1.50	1.25	1.25	1.50	1.50	1.25	1.75	1.75	1.25	.....	1.25	.....	1.10	1.10	1.00	1.00	.95
Richmond, Va.	1.50	2.00	1.88	.75	1.00	2.00	1.00	2.00	1.63	1.63	1.63	1.63	1.63	1.40	1.40	1.75	1.75	1.00	1.00	1.50	[3].....	1.63	1.63	1.38	1.63	.85
St. Louis, Mo.	1.95	2.25	2.00	1.20	1.20	2.25	1.33	2.25	1.75	1.95	2.00	2.05	2.25	1.80	1.88	2.05	2.13	[12]1.88	1.75	1.88	2.00	1.65	2.20	[24]1.65	2.20	[25]1.25
St. Paul, Minn.	1.65	1.83	1.75	1.15	1.15	1.83	1.25	1.90	1.70	1.70	1.83	1.90	1.85	1.65	1.55	1.75	1.75	1.58	1.58	1.75	[3].....	1.70	1.70	[2, 28]1.70	1.85	[29]1.30
St. Petersburg, Fla.	1.63	2.25	1.63	.85	.85	2.25	1.13	2.25	2.25	2.25	1.50	1.50	2.00	1.38	1.38	2.00	2.00	1.50	1.38	1.50	1.50	1.25	1.50	....	[cc]1.50	[t]1.50
Salt Lake City, U.	1.50	1.88	1.75	1.00	1.00	1.75	1.38	2.00	1.80	1.80	1.50	2.00	1.68	1.50	1.33	1.75	1.63	1.58	1.58	1.50	[3].....	1.50	1.50	1.63	1.78	[bb]1.48
San Antonio, Tex.	1.63	1.94	1.75	.58	.58	1.94	1.00	2.25	1.63	1.75	1.85	1.63	1.80	1.50	1.50	1.88	1.88	1.25	1.25	1.75	[3].....	1.50	1.50	1.25	1.50	.75
San Siego, Calif.	1.65	2.00	1.90	1.15	1.15	2.00	1.38	2.00	1.80	1.80	1.78	2.00	1.88	1.65	1.62	2.00	2.00	1.43	1.38	1.75	[3].....	1.83	1.83	1.70	1.90	1.38
San Francisco, Cal.	1.75	[22]2.25	2.00	1.25	.....	[22]2.25	[22]1.75	[22]2.25	2.00	2.15	1.88	[22]2.25	2.00	[19]1.75	1.65	2.00	2.00	1.75	1.75	2.00	[3].....	1.85	1.85	1.95	2.25	[x]1.88
Seattle, Wash.	1.80	2.11	1.93	1.41	1.30	2.11	1.65	2.11	1.86	1.86	1.81	2.01	2.01	1.81	1.76	2.20	2.20	1.81	1.81	1.96	1.95	1.95	1.95	1.70	2.20	1.70
Springfield, Ill.	1.88	2.00	2.00	1.25	1.20	2.00	1.40	2.25	2.00	2.15	1.75	1.75	1.88	1.75	1.75	2.15	2.15	1.63	1.63	1.90	[3].....	1.35	1.75	[28]1.75	1.75	[30dd]1.60
Syracuse, N. Y.	1.85	2.10	2.00	1.20	1.20	.....	.....	2.00	1.95	1.95	1.90	2.00	2.10	1.65	.....	1.88	1.88	1.85	.....	1.85	.....	2.00	2.25	1.70	2.25	....
Tacoma, Wash.	1.81	2.50	2.01	1.45	1.45	.....	.....	2.25	.....	1.86	1.94	2.15	2.01	1.81	1.72	2.00	.....	1.81	.....	1.96	.....	1.95	1.95	1.70	[33]2.50	....
Toledo, Ohio	2.00	2.00	2.00	1.18	.....	2.00	1.23	2.00	1.88	1.88	1.97	[18]2.00	2.00	1.78	1.55	1.94	1.94	1.73	.....	1.73	[3].....	1.63	.....	[31]1.63	2.00	[32u]1.50
Topeka, Kan.	1.50	1.88	1.88	.85	.85	1.88	.90	1.75	.....	1.75	1.63	1.63	1.65	1.50	1.50	1.75	1.75	1.50	1.75	1.65	[3].....	1.37	1.50	1.25	1.63	.95
Trenton, N. J.	2.00	2.18	2.30	1.25	.....	2.18	1.25	2.18	2.18	2.18	2.18	2.00	2.50	1.75	1.75	2.10	2.10	1.85	1.85	2.00	[3].....	2.40	2.40	[31]1.75	2.50	....
Wilmington, Del.	1.88	2.25	2.15	1.05	1.05	2.05	1.30	2.00	1.88	1.63	1.63	1.63	2.10	1.50	1.75	1.95	1.95	2.00	.....	1.85	2.00	2.13	2.13	1.75	2.25	1.25

NOTE: Hourly rates are rounded to closest cent where fractional parts of cent are quoted. [1] Brush. [2] Over 50-hp. [3] Rate of craft with which they work. [4] Metal. [5] 8 hr. pay for 7 hr. work. [6] Metal and plate. [7] Multiple drum. [8] Over 40-hp. [9] Terrazzo only. [10] Less than 2 ton. [11] Ornamental. [12] Slate and tile. [13] 1 and 2 drum. [14] 3 drum. [15] $.65 plus. [16] $.75 plus. [17] $1.50 plus. [18] Day 7 hr. [19] Inside, $1.30. [20] 1½ ton. [21] Hard. [22] Day 6 hr. [23] $1.90 plus. [24] Under 50 -hp. [25] Under 7 cu. yd. [26] With attachments. [27] Hours unlimited. [28] Without power takeoff, $1.50. [29] 6–8 cu. yd. [30] 8 cu. yd. and under. [31] Bulldozer. [32] Day 9 hr. [33] 120-B type and over. [34] Over 3 ton.

WAGE RATE RANGES: [a] 50¢ to 65¢. [b] $1.50 to $1.62. [c] 75¢ to $1.00. [d] $1.00 to $1.25. [e] $1.75 to $1.88. [f] $1.30 to $1.45. [g] $1.25 to $1.75. [h] $1.50 to $1.60. [i] 95¢ to $1.10. [j] $1.35 to $1.50. [k] $1.58 to $1.75. [l] $1.25 to $1.35. [m] 85¢ to 90¢. [n] $1.50 to $1.75. [o] $1.50 to $1.70. [p] 90¢ to $1.25. [q] $1.00 to $1.90. [r] $1.55 to $1.75. [s] 95¢ to $1.35. [t] $1.13 to $1.50. [u] $1.15 to $1.50. [v] $2.00 to $2.25. [w] $1.90 to $2.00. [x] $1.25 to $1.88. [y] $1.75 to $2.00. [z] 65¢ to $1.00. [aa] 93¢ to $1.05. [bb] $1.10 to $1.48. [cc] $1.25 to $1.50. [dd] $1.35 to $1.60.

EVERY AVAILABLE BUILDING
IS NEEDED TODAY

Many a useful building is standing in the way of street widening projects, civic improvements, business expansion programs, etc. now being contemplated.

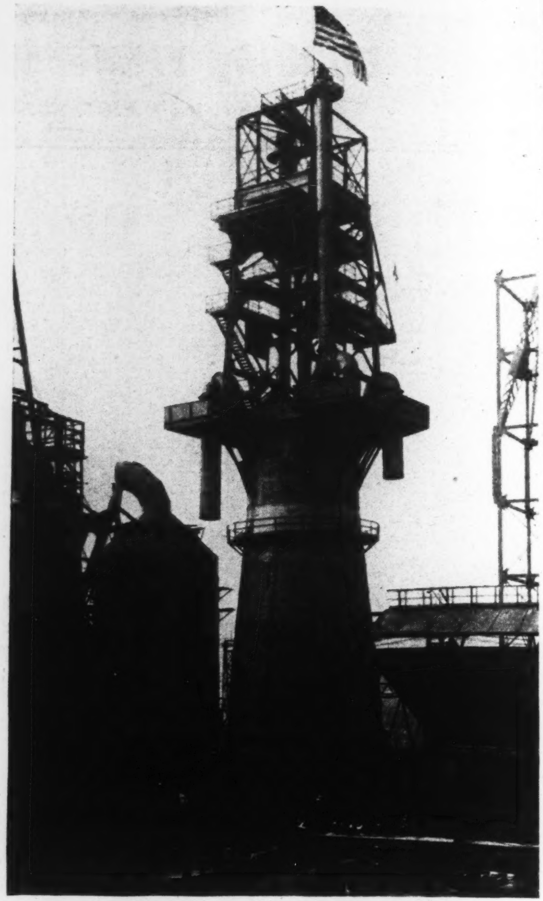
Consider moving these structures to another location before proceeding with plans to tear them down.

It is extravagant and uneconomical to tear down a sound structure that will continue to produce substantial revenue in a different location, perhaps within a few yards of the present site.

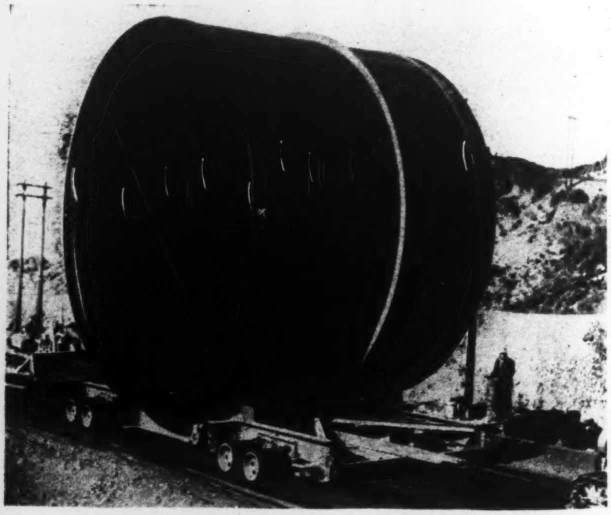
Call on Eichleay to solve your problem. Eichleay engineers such movings with skill, experience and precision. The greatest economy of time and money is assured. Write, wire or phone for estimates.

SHORING • RIGGING • FOUNDATIONS
UNDERPINNING • EQUIPMENT INSTALLATIONS
BUILDING MOVING

EICHLEAY ENGINEERING CORP.
33 South 19th Street Pittsburgh 3, Pa.



While a new Blast Furnace was being erected, the old furnace continued to produce pig iron. It was then dismantled and the new furnace was moved 112 ft. on to the old foundation.



One of many thirty ft. diameter penstock pipe sections transported to Boulder Dam for lowering into final position. Eichleay was recently awarded a similar job at Shasta Dam where work is now in progress.

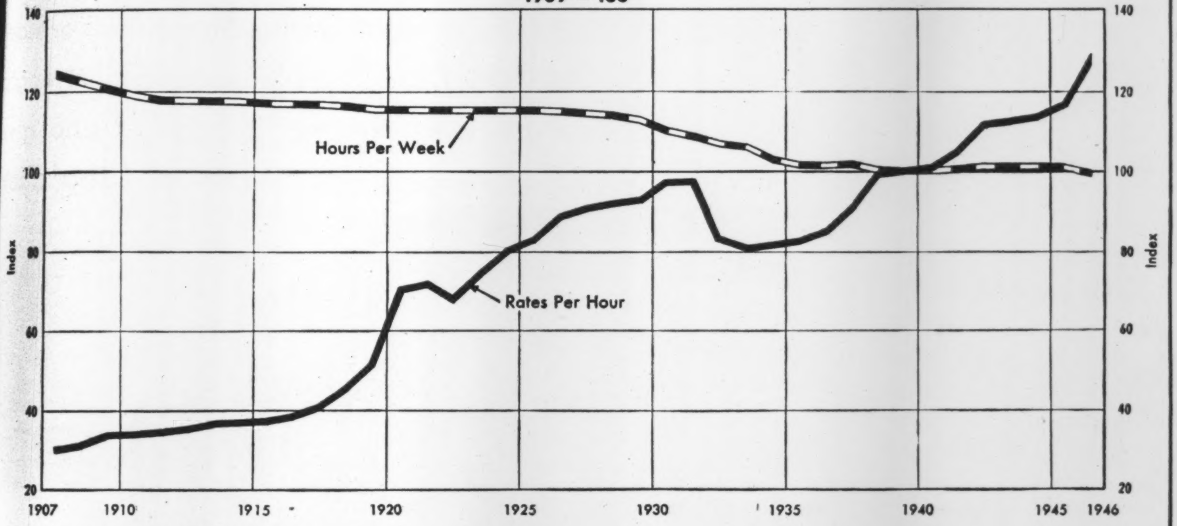
12,500 Ton Bell Telephone Co. building, Indianapolis, Ind. moved 52 ft. and pivoted 90 degrees. While the moving was going on, all normal business operations, elevators, switchboards, etc. were uninterrupted.

Labor Department Analysis of Union Building Wages

Hourly wage rates for organized ilding-trades journeymen averaged 1.792 on July 1, 1946, an increase of 10.8 percent over July 1, 1945, in the 75 cities surveyed by the Bureau of Labor Statistics, U. S. Department of Labor, and reported in Monthly Labor Review, January, 1947. Helpers and laborers averaged $1.138, a

TRENDS IN UNION WAGE RATES AND HOURS IN BUILDING TRADES

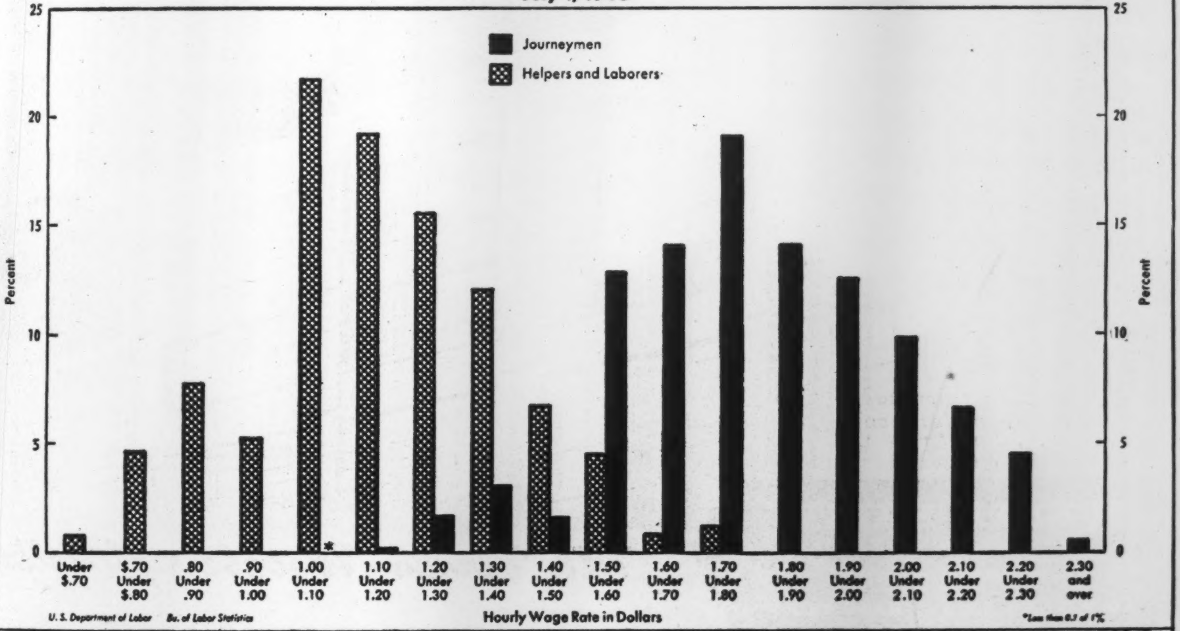
1939 = 100



U. S. Department of Labor   Bu. of Labor Statistics

DISTRIBUTION OF UNION BUILDING TRADES WORKERS ACCORDING TO HOURLY WAGE RATES

July 1, 1946



U. S. Department of Labor   Bu. of Labor Statistics

*Less than 0.1 of 1%

Tougher 'Tarps' from Tougher Duck

YOU GET *TOUGHER* TARPS when they are made of MT. VERNON Extra duck . . . Tarps that can take rough handling and the abuse of all kinds of weather. This toughness and resistance to the battering of weather is woven into all MT. VERNON Extra duck. Made from choice grades of cotton and woven to a high degree of uniformity under rigid laboratory controls, MT. VERNON Extra duck has uniform strength throughout. For Tarpaulins that will last longer and give better job protection — specify MT. VERNON Extra duck.

MT. VERNON EXTRA
uniformity makes the big difference

TURNER HALSEY
COMPANY
Selling Agents
40 WORTH ST. • NEW YORK

Mt. Vernon-Woodberry Mills

Branch Offices: CHICAGO • NEW ORLEANS • ATLANTA • BALTIMORE • BOSTON • LOS ANGELES • SAN FRANCISCO

16.2 percent rise. Straight-time weekly hours averaged 39.1 for journeymen, 39.5 for helpers and laborers.

A majority of journeymen had hourly rates ranging from $1.60 to $1.90, while a similar proportion of helpers and laborers were paid between $1.00 and $1.40. Among journeymen, bricklayers recorded the highest average rate, $2.058, and paperhangers the lowest, $1.600. The highest individual rate reported, $2.79, covered outdoor-advertising sign painters in New York City; the lowest rate noted, $0.60, covered building laborers in Jackson, Miss.

Union wage scales have been the subject of annual studies made by the Bureau of Labor Statistics since 1907. The original studies included 39 cities; the scope has been gradually increased so that the current report covers 75 cities ranging in size from 40,000 to over 1,000,000. For many years data were collected as of May 15. The survey date was advanced to June 1 in 1939 and then to July 1 in 1942. The latest change was made to coincide with the effective date of the national agreement stabilizing construction wages.

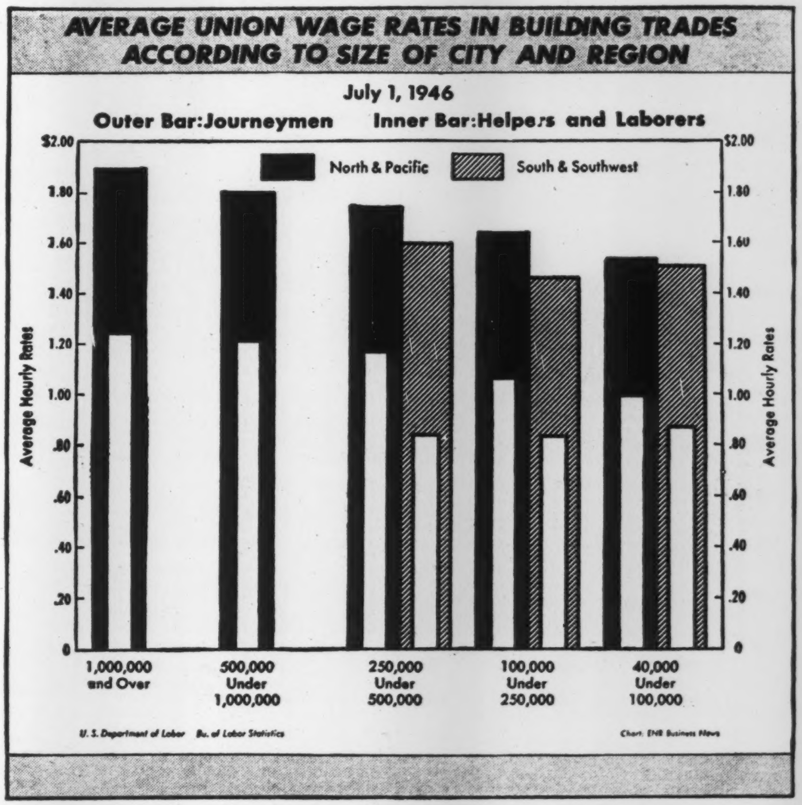
Average Union Hourly Wage Rates in the Building Trades, by Cities and Population Groups, July 1, 1946

Population Groups	Average Hourly Rate	
Cities in Each Population Group	Journeymen	Helpers and Laborers
I (over 1,000,000)		
New York, N. Y	$2.087	$1.442
Chicago, Ill	1.949	1.322
Average for Group I	**1.902**	**1.245**
Philadelphia, Pa	1.849	1.036
Detroit, Mich	1.825	1.201
Los Angeles, Calif	1.609	1.141
II (500,000 to 1,000,000)		
Washington, D. C	1.929	1.073
Pittsburgh, Pa	1.928	1.255
Buffalo, N. Y	1.904	1.276
St. Louis, Mo	1.856	1.233
Average for Group II	**1.815**	**1.207**
San Francisco, Calif	1.797	1.318
Cleveland, Ohio	1.784	1.266
Baltimore, Md	1.747	.986
Boston, Mass	1.743	1.183
Milwaukee, Wis	1.637	1.227
III (250,000 to 500,000)		
Newark, N. J	2.138	1.393
Toledo, Ohio	1.823	1.155
Cincinnati, Ohio	1.799	1.137
Kansas City, Mo	1.783	1.234
Seattle, Wash	1.760	1.296
Rochester, N. Y	1.755	1.127
Denver, Colo	1.738	1.220
Indianapolis, Ind	1.711	1.017
Average for Group III	**1.702**	**1.048**
Houston, Texas	1.696	.883
Minneapolis, Minn	1.686	1.183
Columbus, Ohio	1.661	.961
Louisville, Ky	1.625	.944
Portland, Ore	1.615	1.174
Birmingham, Ala	1.601	.810
Memphis, Tenn	1.593	.804
Dallas, Texas	1.559	.870
Providence, R. I	1.554	1.012
San Antonio, Texas	1.543	.776
New Orleans, La	1.535	.813
Atlanta, Ga	1.494	.792
IV (100,000 to 250,000)		
Dayton, Ohio	$1.786	$1.069
Youngstown, Ohio	1.782	1.077
Peoria, Ill	1.769	1.133
South Bend, Ind	1.726	1.197
New Haven, Conn	1.679	1.140
Spokane, Wash	1.676	1.197
Springfield, Mass	1.670	1.084
Rock Island (Ill.) district*	1.651	1.066
Omaha, Nebr	1.627	.838
Des Moines, Iowa	1.619	1.062
Erie, Pa	1.616	1.038
Oklahoma City, Okla	1.615	.897
Reading, Pa	1.602	1.005
Average for Group IV	**1.593**	**1.013**
Worcester, Mass	1.562	1.053
Grand Rapids, Mich	1.555	.983
Salt Lake City, Utah	1.549	1.072
Scranton, Pa	1.542	.951
Duluth, Minn	1.518	1.021
Nashville, Tenn	1.503	.765
Wichita, Kans	1.474	.932
Richmond, Va	1.470	1.160
Norfolk, Va	1.457	.826
Jacksonville, Fla	1.436	.768
Tampa, Fla	1.413	.783
Charlotte, N. C	1.366	1.015
V (40,000 to 100,000)		
Butte, Mont	1.811	1.169
Charleston, W. Va	1.690	.951
Phoenix, Ariz	1.659	1.062
Mobile, Ala	1.552	.680
Madison, Wis	1.540	1.056
Binghamton, N. Y	1.535	.....
Average for Group V	**1.532**	**.912**
El Paso, Texas	1.510	.....
Little Rock, Ark	1.479	.716
Manchester, N. H	1.449	.921
Portland, Maine	1.416	1.038
Charleston, S. C	1.409	.773
York, Pa	1.374	.859
Jackson, Miss	1.368	.664

* Includes Rock Island and Moline, Ill., and Davenport, Iowa.

Average Hourly Wage Rates an Straight-Time Weekly Hours

Trade	Average Rate per Hour	Hours per Week
All building trades	**$1.670**	**39.2**
Journeymen	1.792	39.1
Asbestos workers	1.799	39.4
Boilermakers	1.867	39.2
Bricklayers	2.058	38.3
Carpenters	1.730	39.3
Cement finishers	1.746	39.9
Electricians, inside wiremen	1.853	38.4
Elevator constructors	1.838	40.0
Glaziers	1.682	39.3
Granite cutters	1.793	38.7
Lathers	1.941	38.5
Machinists	1.800	39.7
Marble setters	1.823	39.7
Mosaic and terrazzo workers	1.806	38.7
Painters	1.705	39.0
Paperhangers	1.600	39.7
Plasterers	1.951	37.9
Plumbers and gas fitters	1.906	38.0
Rodmen	1.749	39.8
Roofers, composition	1.616	39.5
Roofers, slate and tile	1.723	40.0
Sheet-metal workers	1.809	39.5
Sign painters	1.884	38.7
Steam and sprinkler fitters	1.879	39.7
Stonecutters	1.974	37.1
Stonemasons	1.964	38.8
Structural-iron workers	1.888	39.9
Tile layers	1.808	40.0
Helpers and laborers	1.138	39.5
Bricklayers' tenders	1.242	39.0
Building laborers	1.065	39.8
Composition roofers' helpers	.989	39.8
Elevator constructors' helpers	1.285	40.0
Marble setters' helpers	1.283	40.0
Plasterers' laborers	1.347	39.0
Plumbers' laborers	1.147	38.9
Steam and sprinkler fitters helpers	1.517	37.2
Terrazzo workers' helpers	1.360	38.6
Tile layers' helpers	1.271	40.0


AVERAGE UNION WAGE RATES IN BUILDING TRADES ACCORDING TO SIZE OF CITY AND REGION

July 1, 1946

Outer Bar: Journeymen Inner Bar: Helpers and Laborers

U. S. Department of Labor Bu. of Labor Statistics

Chart: ENR Business News

Index of Union Hourly Wage Rates in Each Building Trade (1939 = 100)

U. S. Bureau of Labor Statistics, Wage Analysis Branch

Year	All Building Trades	Journeymen	Helpers & Laborers	Bricklayers	Carpenters	Cement Finishers	Electricians (Inside Wiring)	Glaziers	Lathers	Painters	Plasterers	Plumbers & Gas Fitters	Sheet Metal Workers	Steam & Sprinkler Fitters	Stonemasons	Structural Ironworkers	Building Laborers	Hod Carriers
1907...	29.3	29.7	27.3	37.7	29.8	34.5	27.9	.....	.....	26.2	37.3	33.3	30.6	30.1	33.9	27.9	30.8	30.3
1908...	31.2	31.6	28.5	38.7	31.7	34.4	30.5	.....	.....	29.0	37.2	33.7	31.3	30.5	34.4	30.4	31.0	30.3
1909...	32.7	33.2	29.5	39.5	33.5	35.5	31.5	.....	.....	31.0	37.5	34.2	31.4	34.7	34.5	32.6	31.1	30.4
1910...	34.0	34.6	30.5	40.2	35.0	35.8	32.4	.....	.....	33.0	37.9	34.5	32.3	32.2	34.8	34.7	32.3	30.9
1911...	34.5	35.2	30.6	40.2	35.5	37.2	32.8	.....	.....	33.6	38.1	36.5	33.[illegible]	33.2	35.2	35.5	32.4	31.2
1912...	35.3	36.0	30.9	40.8	36.3	37.2	33.1	.....	33.8	34.0	38.9	36.7	34.1	33.8	35.5	36.1	32.7	31.4
1913..	36.1	36.9	31.8	41.5	36.8	38.0	33.8	.....	34.6	35.5	39.3	37.9	35.6	35.0	36.7	37.3	34.2	31.8
1914...	36.9	37.7	32.1	42.5	37.4	38.4	34.9	.....	35.2	36.7	39.4	38.4	36.9	35.7	37.8	38.0	34.5	32.2
1915...	37.2	38.0	32.4	42.6	37.8	38.8	35.6	.....	35.7	36.9	39.6	38.7	37.4	36.5	38.2	38.0	34.7	32.4
1916...	38.4	39.3	33.5	43.0	39.0	39.1	36.3	.....	36.7	40.3	41.0	39.0	38.0	37.2	38.8	38.6	36.3	33.4
1917...	40.8	41.5	36.8	44.5	42.4	41.4	38.7	.....	38.1	41.5	42.2	40.4	39.7	38.6	40.2	40.9	40.1	37.2
1918...	45.3	45.9	42.6	47.8	47.1	45.7	43.0	40.6	41.2	45.8	44.5	44.6	46.5	42.2	44.1	46.8	37.0	43.4
1919...	51.9	52.4	49.3	53.0	54.2	41.2	49.3	43.4	45.8	53.6	51.3	50.4	51.3	47.4	49.5	52.7	53.3	50.8
1920...	70.0	70.1	71.5	72.4	72.5	69.6	65.0	62.8	65.3	74.0	67.0	65.2	68.8	62.6	69.0	66.8	77.2	73.9
1921...	71.3	71.4	72.2	71.9	73.1	71.9	67.3	63.9	66.3	75.1	70.7	68.2	71.3	63.4	70.0	68.1	77.6	74.2
1922...	66.9	67.3	65.7	70.0	67.7	66.7	63.5	64.0	62.3	70.3	67.9	63.4	66.1	61.9	65.8	61.8	72.9	61.5
1923...	73.9	74.2	69.7	79.2	75.5	73.0	65.9	67.9	68.8	77.1	75.7	70.0	71.2	65.0	77.8	65.9	74.3	67.2
1924...	79.8	80.1	75.4	83.8	80.8	80.7	73.6	71.6	74.2	81.2	84.7	76.3	78.2	74.5	82.5	74.6	82.7	70.2
1925...	82.9	83.1	77.9	88.7	82.5	81.1	77.4	79.6	80.9	85.7	86.1	77.9	80.8	78.4	84.1	75.4	79.0	78.4
1926...	88.3	88.7	84.9	94.1	88.5	86.6	81.5	80.7	83.0	90.9	92.4	83.9	86.3	84.9	92.7	81.1	86.9	85.5
1927...	91.3	91.7	86.4	96.4	91.4	90.4	84.9	86.2	86.3	93.9	94.4	85.6	88.9	87.3	93.9	86.8	87.2	87.5
1928...	91.9	92.4	87.3	97.2	91.7	89.5	85.7	87.2	86.6	95.4	94.6	87.4	87.2	88.6	95.0	87.0	87.6	87.6
1929...	93.1	93.6	88.8	99.4	93.2	89.5	89.3	88.5	85.9	95.2	93.5	88.1	90.6	89.1	97.7	87.7	88.9	91.4
1930...	97.0	97.5	93.3	101.8	96.9	95.4	90.0	92.6	89.6	100.6	98.1	91.5	94.7	93.5	99.1	92.5	92.9	94.9
1931...	97.3	97.8	92.8	101.6	97.1	95.8	92.1	93.2	89.1	101.0	97.9	92.6	96.2	94.0	99.6	93.4	91.5	94.6
1932...	83.1	83.6	79.2	87.0	79.6	83.6	87.9	78.0	80.0	85.3	81.4	80.5	83.4	81.0	88.4	81.0	78.7	78.4
1933...	80.8	81.4	75.7	84.7	79.4	81.6	80.3	77.9	77.1	83.6	78.2	79.8	81.0	78.6	82.5	80.1	74.1	77.4
1934...	81.4	81.8	77.9	85.0	80.8	82.4	80.4	82.5	79.1	82.3	79.1	80.5	81.3	79.5	82.4	81.1	76.9	82.5
1935...	82.3	82.8	78.3	83.7	81.8	82.9	84.3	83.3	80.0	82.6	80.0	81.8	81.9	80.8	82.2	81.8	78.0	79.9
1936...	85.3	85.5	82.9	84.2	86.0	85.0	86.5	84.5	82.0	86.8	80.5	83.9	83.5	83.5	83.2	83.9	84.7	84.2
1937...	91.2	91.4	90.1	90.1	91.6	91.2	90.3	92.6	87.5	93.0	88.7	88.5	89.6	88.1	91.9	91.6	92.7	90.6
1938...	99.3	99.3	99.2	99.5	99.8	99.6	99.5	99.3	96.8	99.2	99.2	99.1	98.6	99.3	99.7	98.9	99.4	99.7
1939...	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1940...	101.6	101.4	102.0	102.2	102.5	100.9	101.7	101.4	100.7	100.2	100.5	101.6	101.8	100.3	99.5	100.4	101.6	103.8
1941...	105.3	105.0	106.8	104.6	104.8	104.5	106.3	104.3	104.5	106.9	102.2	106.0	106.5	103.4	102.1	105.2	107.6	107.3
1942...	111.9	110.9	117.5	108.3	112.1	110.8	113.5	108.8	109.1	110.5	105.0	110.5	116.0	109.3	108.0	108.7	119.6	115.7
1943...	112.7	111.5	118.9	108.7	112.5	112.0	113.8	109.6	109.2	112.4	105.2	110.9	116.4	109.9	108.4	109.1	121.3	116.4
1944...	113.6	112.4	120.3	110.0	113.4	113.1	114.7	110.2	110.0	113.5	105.9	111.5	117.2	110.5	108.0	109.8	122.9	117.4
1945...	116.0	114.4	125.9	112.7	115.4	114.2	116.9	112.2	111.5	115.1	107.6	114.0	118.4	114.3	111.4	111.6	129.9	121.8
1946...	129.3	126.8	146.3	125.6	129.7	128.2	124.9	123.4	124.2	127.3	119.0	123.2	133.0	124.6	126.5	121.4	152.2	141.7

Index of Union Weekly Hours in Each Building Trade (1939 = 100)

Year	All Building Trades	Journeymen	Helpers & Laborers	Bricklayers	Carpenters	Cement Finishers	Electricians (Inside Wiring)	Glaziers	Lathers	Painters	Plasterers	Plumbers & Gas Fitters	Sheet Metal Workers	Steam & Sprinkler Fitters	Stonemasons	Structural Ironworkers	Building Laborers	Hod Carriers
1907...	124.3	123.8	126.1	122.9	121.0	122.7	124.2	.....	.....	131.1	125.8	120.6	117.0	120.3	118.4	121.3	121.6	118.9
1908...	122.4	122.0	123.5	120.3	119.2	121.6	123.3	.....	.....	131.0	125.2	120.7	116.9	120.3	118.4	118.9	121.6	118.9
1909...	120.7	120.5	121.0	117.8	117.8	112.5	122.5	.....	.....	129.2	125.2	120.7	116.9	120.0	118.4	117.3	121.2	118.5
1910...	119.2	119.1	118.8	115.6	116.4	122.3	121.8	.....	.....	127.5	125.1	120.5	116.9	119.3	116.6	116.0	118.3	117.5
1911...	118.8	118.7	118.6	115.1	115.8	121.1	121.6	.....	.....	126.7	125.8	120.2	116.6	119.2	115.8	115.8	118.3	116.9
1912...	118.4	118.3	118.3	115.1	115.7	121.1	121.2	.....	121.8	126.6	124.3	119.2	115.1	118.4	115.8	114.6	118.3	116.0
1913...	118.2	118.0	118.3	114.9	115.6	119.8	120.7	.....	121.8	125.9	124.3	119.2	114.9	118.0	115.7	114.1	118.3	116.0
1914...	117.7	117.7	117.6	114.4	115.1	119.0	120.3	.....	121.8	125.6	125.2	118.8	114.8	116.5	115.7	113.9	117.9	114.5
1915...	117.6	117.6	117.5	114.3	115.1	119.0	119.6	.....	121.2	125.6	123.6	118.8	114.6	116.5	115.6	113.9	117.9	114.5
1916...	117.2	117.1	117.2	114.1	115.1	117.2	118.6	.....	121.2	124.7	122.3	118.2	114.1	116.1	115.4	113.6	117.3	114.5
1917...	116.9	116.9	116.7	113.7	115.1	115.9	118.1	.....	120.6	124.6	122.2	118.1	114.0	116.0	115.3	113.4	116.0	114.4
1918...	116.3	116.2	116.3	113.7	113.9	115.3	117.3	118.0	120.6	124.0	121.9	117.1	112.8	114.9	115.3	113.0	115.5	114.4
1919...	115.7	115.7	115.2	113.5	113.2	114.4	116.3	118.0	120.3	123.8	121.9	116.7	112.3	114.8	114.6	112.8	113.3	114.0
1920...	115.1	115.2	114.5	113.4	113.3	113.8	116.0	117.5	119.6	120.2	121.6	116.7	111.9	114.7	114.6	112.8	112.1	113.8
1921...	115.0	115.1	114.5	113.4	113.2	113.8	116.0	118.0	119.3	120.3	121.3	116.5	111.[illegible]	114.6	114.7	112.8	112.1	113.8
1922...	115.0	115.2	114.2	113.4	113.3	113.7	116.0	118.1	119.4	121.2	121.4	116.5	111.8	114.6	114.6	112.8	111.3	114.0
1923...	115.1	115.3	114.4	113.4	113.7	113.7	116.0	117.5	119.8	120.9	122.0	116.5	111.8	114.6	114.6	112.8	112.1	114.0
1924...	115.1	115.3	114.4	113.3	113.5	113.7	115.9	117.5	119.6	120.8	122.1	116.5	111.8	114.6	114.3	112.8	111.8	113.9
1925...	115.1	115.3	114.2	113.2	113.5	113.4	115.9	117.1	119.2	121.1	121.7	116.5	111.8	114.6	114.3	112.5	111.9	113.8
1926...	114.9	115.1	113.9	113.3	113.5	113.4	115.9	116.5	118.9	120.7	118.2	116.5	111.8	114.4	114.5	112.8	112.1	113.9
1927...	114.7	114.8	113.9	112.7	113.5	113.0	115.9	117.9	118.3	120.2	117.7	116.2	111.4	114.2	114.3	112.8	112.3	113.9
1928...	114.0	114.0	113.8	112.7	112.9	112.4	115.3	117.4	117.7	117.0	116.7	116.2	111.1	114.2	114.2	112.7	112.2	113.9
1929...	113.0	113.3	111.5	109.8	112.9	112.5	112.6	116.1	117.1	116.7	115.6	115.2	111.0	113.6	110.9	112.2	112.1	107.6
1930...	109.8	110.0	109.0	107.1	109.4	108.1	109.9	112.4	110.4	115.	113.0	109.9	106.9	108.5	107.1	108.8	110.0	106.9
1931...	108.5	108.5	108.1	105.5	107.7	106.9	108.8	110.5	109.8	114.4	112.1	108.4	105.1	107.4	105.2	107.5	108.7	106.6
1932...	106.5	106.6	105.7	103.1	105.0	105.6	106.2	107.9	109.3	114.2	110.0	108.0	10[illegible].6	106.4	104.8	104.8	104.9	104.0
1933...	106.2	106.2	105.2	104.2	103.4	107.6	106.2	107.9	108.8	114.0	112.4	107.5	103.5	105.8	104.0	104.5	104.5	103.4
1934...	102.3	102.3	101.9	102.4	102.5	103.7	99.9	102.3	102.5	99.9	107.6	106.5	102.0	105.1	103.5	103.0	99.9	101.5
1035...	101.5	101.5	101.2	102.3	102.0	103.5	95.8	101.6	102.3	99.8	105.9	105.8	102.1	104.8	103.4	101.8	99.8	101.4
1936...	101.5	101.5	101.4	02.3	102.1	103.0	96.2	102.0	101.3	100.2	104.2	104.4	102.0	105.0	103.4	101.7	100.3	101.2
1937...	101.9	101.9	101.8	103.3	101.9	103.1	100.9	102.1	102.7	100.2	104.3	105.0	102.1	105.1	103.4	101.2	100.6	101.5
1938...	100.2	100.1	100.2	100.0	100.0	100.0	100.3	100.2	100.8	110.4	100.0	99.7	100.0	99.6	100.0	100.1	100.1	100.3
1939...	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1940...	99.9	100.0	99.4	99.7	100.0	100.2	100.0	100.0	99.8	100.5	99.2	99.0	100.0	100.0	99.9	100.0	99.4	99.9
1941...	100.3	100.5	99.7	99.9	100.6	100.7	100.6	100.6	100.7	100.7	100.0	99.4	100.8	100.6	100.0	100.4	99.7	99.8
1942...	101.1	101.8	98.8	100.8	100.8	100.6	104.6	102.0	102.5	106.5	102.0	99.9	100.9	102.2	100.2	101.1	98.8	98.6
1943...	101.0	102.0	98.1	100.8	100.8	100.6	104.6	102.0	103.4	106.5	106.0	101.8	100.9	102.2	100.2	101.1	97.4	98.4
1944...	101.2	102.2	98.1	100.8	101.1	100.6	104.6	102.0	103.6	106.8	106.1	101.8	100.9	102.2	100.2	101.1	97.4	98.4
1945...	101.2	102.2	98.1	100.8	101.1	100.6	104.6	102.0	103.6	106.8	106.1	101.8	100.9	102.2	100.2	101.1	97.4	98.4
1946...	100.2	101.1	97.4	100.3	100.3	100.4	100.5	102.0	102.2	106.1	104.1	98.3	100.8	101.3	100.0	101.1	97.2	96.9

Wage Rates per Hour New York City

	Carpenters, 10 Hr. Day	Bricklayers, 8 Hr. Day	Masons' Laborers, 8 Hr. Day	Common Laborers, 10 Hr. Day	Structural Iron-Workers
1874	$0.23	$0.43	$0.18	$0.14	......
1875	.22½	.37	.18	.14	......
1876	.21	.31	.17	.14	......
1877	.20	.31	.15	.12	......
1878	.18	.31	.15	.11	......
1879	.17	.31	.16	.11	......
1880	.18	.34	.18	.12	......
1881	.19	.46	.21	.13	......
1882	.21	.50	.22	.15	......
1883	.21	.50	.23	.13	......
1884	.21	.50	.22	.13	......
1885	.20	.50	.22	.13	......
1886	.21	.50	.23	.13	......
1887	.21	.50	.20	.14	......
1888	.22	.50	.16	.12	......
1889	.22	.50	.23	.13	......
	8 Hr. Day			9 Hr. Day	
1890	.43	.47	.28	.14	......
1891	.43	.47	.28	.14	......
1892	.44	.50	.29	.14	......
1893	.43	.50	.30	.14	......
1894	.44	.50	.30	.14	......
1895	.43	.50	.30	.14	......
1896	.44	.50	.30	.14	......
1897	.44	.50	.29	.14	......
1898	.44	.50	.30	.14	......
1899	.45	.55	.33	.14	......
1900	.50	.56	.33	.14	......
1901	.50	.59	.33	.19	......
1902	.51	.65	.36	.17	......
1903	.56	.65	.36	.16	......
1904	.53	.65	.36	.19	......
1905	.54	.70	.36	.20	......
1906	.58	.70	.38	.21	......
				—8 Hr. Day—	
1907	.62½	.70	.37½	.22	$0.60
1908	.62½	.70	.37½	.22	.60
1909	.62½	.70	.37½	.22	.60
1910	.62½	70	.37½	.22	.62½
1911	.62½	.70	.37½	.22	.62½
1912	.62½	.70	.37½	.23	.62½
1913	.62½	.70	.37½	.22½	.62½
1914	.62½	.75	.37½	.22½	.62½
1915	.62½	.75	.37½	.25	.62½
1916	.62½	.75	.37½	.25	.66
1917	.69	.75	.42½	.30	.68
1918	.69	.81	.47	.40½	.80
1919	.75	.87½	.57½	.40½	.87½
1920	1.12½	1.25	.77½	.75	1.12½
1921	1.12½	1.25	.87½	.60	1.12½
1922	1.12½	1.25	.87½	.60	1.12½
1923	1.12½	1.50	.95	.61½	1.12½
1924	1.31½	1.50	1.00	.68½	1.29
1925	1.31½	1.50	1.00	.65½	1.46½
1926	1.45	1.64½	1.07	.81½	1.60
1927	1.50	1.75	1.12½	.90½	1.75
1928	1.50	1.75	1.12½	.90½	1.75
1929	1.55	1.84	1.15	.98½	1.81
1930	1.65	1.92½	1.03½	.03½	1.92½
1931	1.45	1.71½	1.02½	.65½	1.92½
1932	1.33	1.47	1.00	.64½	1.67½
1933	1.37½	1.57½	.91	.72½	1.65
1934	1.40	1.53	.82½	.84½	1.62
1935	1.40	1.50	.82½	.68	1.65
1936	1.40	1.50	.82½	.65	1.58
1937	1.60	1.73	.91	.76	1.79
	—7 Hr. Day—				
1938	1.75	1.88½	.99½	.91½	1.92½
1939	1.75	1.89½	1.03½	.91½	1.92½
1940	1.81	1.96	1.03½	.91½	1.96½
1941	1.85	2.00	1.03½	.93$\frac{7}{16}$	2.00
1942	1.85	2.00	1.03½	.95	2.00
1943	1.85	2.00	1.03½	.95	2.00
1944	1.85	2.00	1.0885	.954	2.00
1945	1.85	2.00	1.10	1.06	2.00
1946	2.10	*2.25	†1.23½	1.2042	2.25
		1945 by months			
Jan.	1.85	2.00	1.10	1.00	2.00
Feb.	1.85	2.00	1.10	1.00	2.00
Mar.	1.85	2.00	1.10	1.00	2.00
April	1.85	2.00	1.10	1.00	2.00
May	1.85	2.00	1.10	1.00	2.00
June	1.85	2.00	1.10	1.10	2.00
July	1.85	2.00	1.10	1.10	2.00
Aug.	1.85	2.00	1.10	1.10	2.00
Sept.	1.85	2.00	1.10	1.10	2.00
Oct.	1.85	2.00	1.10	1.10	2.00
Nov.	1.85	2.00	1.10	1.10	2.00
Dec.	1.85	2.00	1.10	1.10	2.00
		1946 by months			
Jan.	2.10	2.25	1.20	1.20	2.25
Feb.	2.10	2.25	1.20	1.20	2.25
Mar.	2.10	2.25	1.20	1.20	2.25
Apr.	2.10	2.25	1.20	1.20	2.25
May	2.10	2.25	1.25	1.20	2.25
June	2.10	2.25	1.25	1.20	2.25
July	2.10	2.25	1.25	1.20	2.25
Aug.	2.10	2.25	1.25	1.20	2.25
Sept.	2.10	2.25	1.25	1.20	2.25
Oct.	2.10	2.25	1.25	1.20	2.25
Nov.	2.10	2.25	1.25	1.20	2.25
Dec.	2.10	2.25	1.25	1.25	2.25
		1947 by months			
Jan.	2.10	2.50	1.25	1.25	2.25
Feb.	2.50	2.50	1.25	1.25	2.50
Mar.	2.50	2.50	1.25	1.25	2.50
April	2.50	2.50	1.50	1.50	2.50

Now one type of

STEEL JOIST

SERVES THE BUILDER

THE MACOMBER V BAR JOIST

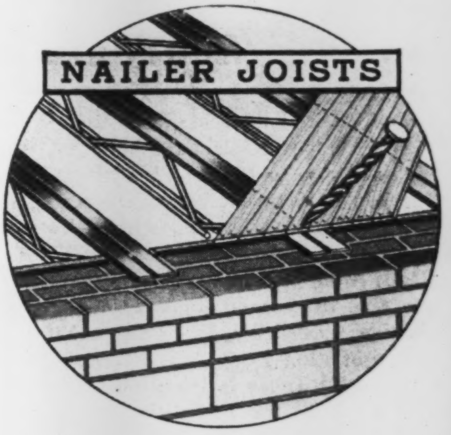
- Illustrated here are the three standard applications of Bar Joists — for poured slabs, for wood floors and as roof purlins.

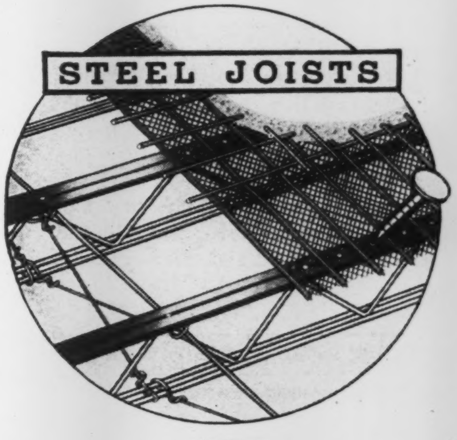
In this way Macomber provides for the secure attachment of all flooring and roofing materials — DIRECT — to the steel joist.

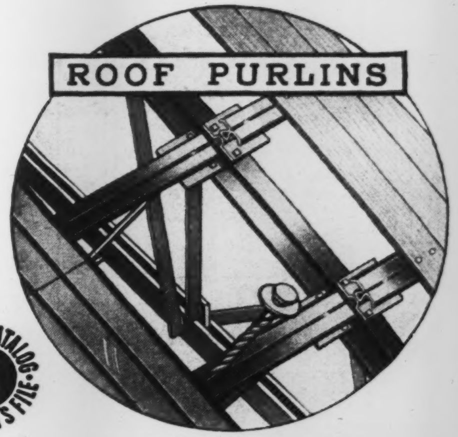
This nailing feature provided by the special top chord replaces the old wood nailing strip. Otherwise the joist is the same as the Original Massillon Bar Joist introduced by Macomber in 1923. Sizes are determined from Standard Steel Joist Loading Tables.

We believe your organization will want complete design information on this improved steel joist which has been in universal use with complete success since March, 1946. These V Bar Joists are sold through authorized Sales Representatives in all principal cities.

Forward the card below for complete information on the one joist with universal application.

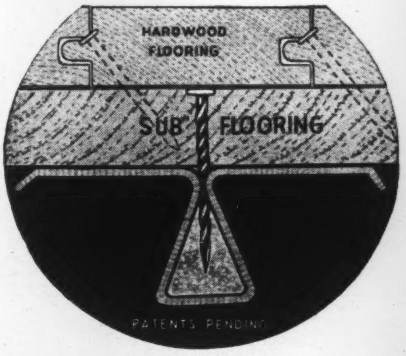

NAILER JOISTS


STEEL JOISTS


ROOF PURLINS

MACOMBER
INCORPORATED • CANTON, OHIO

SEE OUR CATALOG IN SWEETS FILE


HARDWOOD FLOORING
SUB FLOORING
PATENTS PENDING

MACOMBER INCORPORATED
Canton, Ohio

Gentlemen:

Please forward a copy of your V JOIST CATALOG for our files.

To ------------------------------------

City------------------------------------

Now one type of
SERVES THE BUILDER
MACOMBER

Also Interested in:
☐ **Roof Trusses**
☐ **Longspans**
☐ **Roof Decking**

Roadbuilding Costs

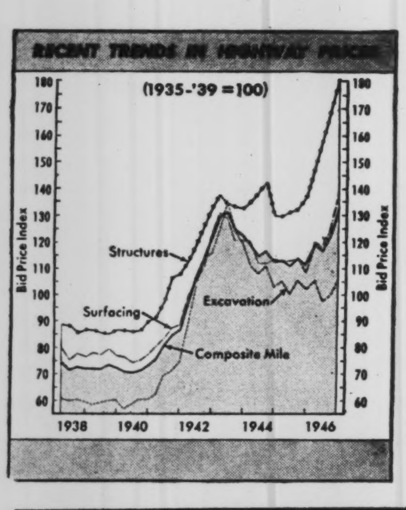
The index of the cost of constructing a composite standard mile of highway rose to 122.9 in 1946 from 111.7 in 1945, an increase of 10 percent, according to the Index of Highway Construction Costs of the Public Roads Administration. The 1946 index was the second highest annual average, exceeded only by the 1943 record of 126.9.

The PRA Index is based on average prices in the 1925-1929 period for a composite mile of road. It included excavation, surfacing and structures. Quantities involved in these three items are considered as constant for the index, but in actual practice, they vary from job to job.

Highway excavation bid price averaged 36¢ per cubic yard in 1946. The value was 37¢ in the first and final quarters of 1946, and 34¢ and 35¢ in the second and third quarters, respectively. Excavation bid prices during the last five years were the highest since the 1920's, averaging 44¢ in 1943; 38¢ in 1944; 37¢ in 1942; and 36¢ in 1945 and 1946.

Surfacing costs, $2.78 per square yard in 1946, rose 12 percent above the 1945 average of $2.48 and equaled the previous all-time high in 1943. The bid price rose to $3.08 per square yard in the last quarter of 1946 from $2.66 in the first quarter.

The structures index for 1946 rose to a new record high of 164.7, exceeding the previous record of 136.5 in 1944. The index was 150.1 in the first quarter of 1946 and rose to 181.2 in the final quarter.



Public Roads Administration
Price Trend in Highway Construction for Composite Standard Mile

Year	Excavation[1] (17,491* cubic yards)		Surfacing[2] (3,726* square yards)		Structures				Composite mile
					Reinforcing steel (16,000* pounds)	Structural steel (4,325* pounds)	Structural concrete (68* cubic yards)	Combined	
	Bid price[3]	Sub-index	Bid price[3]	Sub-index	Bid price[3]	Bid price[3]	Bid price[3]	Sub-index	Index
Base period, 1925 to 1929..	$0.35†	100.0	$2.22†	100.0	$0.052†	$0.067†	$22.15†	100.0	100.0
1922..........	.40	114.5	2.28	102.7	.050	.074	20.18	95.1	105.8
1923..........	.47	133.3	2.43	109.5	.057	.078	23.37	108.6	117.9
1924..........	.43	122.2	2.40	108.3	.057	.077	22.91	107.2	113.1
1925..........	.39	110.0	2.36	106.4	.056	.067	22.53	103.9	107.5
1926..........	.36	103.7	2.29	103.1	.053	.074	22.76	103.7	103.4
1927..........	.35	100.3	2.29	103.3	.051	.071	22.65	101.5	101.9
1928..........	.34	96.0	2.10	94.5	.049	.067	21.22	96.1	95.3
1929..........	.32	90.0	2.05	92.7	.048	.059	21.58	95.0	92.1
1930..........	.30	86.3	1.86	84.1	.045	.061	20.08	89.4	85.7
1931..........	.27	77.6	1.68	75.6	.040	.054	18.02	79.9	76.8
1932..........	.18	55.0	1.44	64.8	.034	.046	15.33	68.0	61.0
1933..........	.26	74.0	1.67	75.1	.038	.046	16.15	72.2	76.7
1934..........	.29	83.3	1.90	85.8	.043	.053	17.73	80.8	84.0
1935..........	.26	73.3	1.90	85.6	.044	.052	17.78	81.5	80.6
1936..........	.26	74.8	1.91	86.0	.046	.060	20.25	90.0	82.9
1937..........	.24	69.0	1.89	85.1	.048	.066	19.76	91.5	79.4
1938..........	.21	59.8	1.72	77.5	.045	.063	19.06	87.2	72.8
1939..........	.21	59.8	1.73	77.8	.044	.059	19.13	85.9	72.6
1940..........	.21	59.2	1.68	75.6	.045	.063	19.17	87.6	71.6
1941..........	.24	69.2	1.89	85.2	.054	.076	21.44	100.8	81.8
1942..........	.37	105.5	2.44	109.7	.065	.090	26.16	122.3	109.9
1943..........	.44	125.6	2.78	125.7	.067	.095	30.19	134.4	126.9
1944..........	.38	108.3	2.54	114.3	.064	.089	31.94	136.5	115.5
1945..........	.36	102.6	2.48	111.8	.062	.077	31.62	132.5	111.7
1946									
1st Quarter...	.37	105.4	2.66	119.9	.067	.105	35.44	150.1	119.3
2d Quarter...	.34	96.9	2.63	118.6	.072	.115	37.01	158.8	117.0
3d Quarter...	.35	99.7	2.75	124.0	.076	.115	39.83	168.6	122.1
4th Quarter...	.37	105.4	3.08	138.8	.083	.118	42.86	181.2	133.3
Average........	.36	101.9	2.78	125.3	.075	.113	38.79	164.7	122.9

[1] Common excavation plus other excavation items expressed as equivalent common excavation.

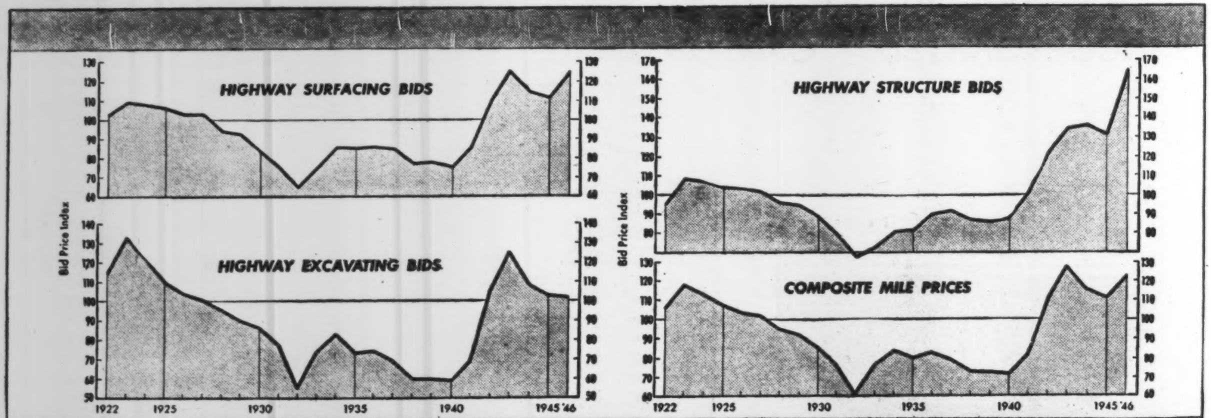
[2] Portland-cement concrete plus other surfacing items expressed as equivalent portland-cement concrete.

[3] Indexes and totals were calculated with the bid prices carried to one more decimal place than that to which they are shown in this table.

Column showing amount of bid price times fixed quantity omitted in this table.

* Fixed quantities used for establishing composite mile for price trend.

† Fixed prices used for establishing composite mile index base.



Depreciation Schedule—U. S. Bureau of Internal Revenue

In January 1942 the U. S. Bureau of Internal Revenue revised its 1931 schedule of probable useful life and depreciation rates. Items of direct interest to civil engineers and contractors are shown in revised Schedule "F", and include those quoted in the following list. The schedule reveals the probable useful life in years. Annual depreciation rates are not given, inasmuch as they are considered to be on a straight-line basis. For example, on an item having a probable useful life of ten years, the annual depreciation rate is 10 percent; for an item having a probable useful life of 25 years, the annual depreciation rate is 4 percent, etc.

BUILDINGS	*BUILDING ONLY* Est. Total Life, Years	*BUILDING & BLDG. EQUIPMENT* Composite rate (percent) Type of construction Good	Average	Cheap
Apartments	50	2½	2½	3
Banks	67	2	2	2½
Dwellings	60	2	2½	3
Factories	50	2½	2½	3
Farm buildings	60	2	2	2½
Garages	60	2	2½	3
Grain elevators	75	1½	2	2½
Hotels	50	2½	2½	3
Loft buildings	67	2	2	3
Machine shops	60	2	2½	3
Office buildings	67	2	2½	3
Stores	67	2	2	2½
Theaters	50	2½	3	3½
Warehouses	75	1½	2	2½

BUILDING EQUIPMENT

	Years
Air conditioning:	
Air conditioning systems—	
Large—over 20 tons	20
Medium—5 to 15 tons	15
Small—under 5 tons	10
Air washer. (See Dehumidifier.)	
Compressors—	
Refrigerating	20
Air for pneumatic controls	20
Condensers—	
Shell and tube	20
Double pipe	20
Evaporation	15
Coolers, water—tank and coil or shell and tube	20
Dehumidifier	10
Drums, purge or surge	20
Ducts and other sheet metal work.*	
Fans	15
Filters, air, oil, self-cleaning	20
Dry cleanable	10
Gauges	15
Grilles and registers—	
Anemostats	20
Grilles and registers—	
Wall type	20
Ceiling	20
Window units	15
Placques	20
Santrols.*	
Heaters—	
Boiler, oil burner and tank	20
Booster heaters	20
Electric heaters	15
Finned tube heaters, steam water cleanable tube	20
Preheaters and reheaters	20
Water heaters, open or closed type	20
Insulation—	
Cork, cold pipes and tanks	20
Magnesia, hot pipes	15
Wool felt	20
Asbestos	15
Louvres and screens, fresh air—	
Copper	25
Steel	15
Manometers	15
Motors—	
Synchronous and exciter set	20
Induction, indoor	20
Induction, weatherproof for outdoor	20
Piping, refrigerant and other	20
Pumps—	
Chilled water	20
Condenser water	20
Condensate	20
Dehumidifiers	22
Evaporative condenser	15
Sump	25
Well	25
Receivers, refrigerant	25
Regulators, suction or static pressure	5
Silicia gel beds	15
Spray pond	15
Switchboard, electric panel	20
Thermometers, room type or recording	15
Tower, cooling	15
Valves—	
Relief	20
Automatic expansion and by-pass	5
Solenoid	15
Water regulating	20
Ammeters	15
Clocks	15
Clocks, watchman	15
Compressors, air and vacuum	20
Electric clock systems:	
Clocks, time	20
Conduits, fittings and wiring. (See lighting systems)	
Motors and generators	20
Switch equipment—	
Boxes.*	
Switch parts	20
Elevators:	
Freight	25
Passenger	20
Fire equipment:	
Fire alarm systems	25
Movable equipment	20
Sprinkler system.*	
Guards, machine	25
Heaters, electric	10
Heaters, gas	15
Heating systems:	
Boilers and furnaces	20
Burner equipment—	
Gas	16
Oil	10
Radiators	25
Lighting systems:	
Conduits and fittings.*	
Wiring	20
Fixtures	15
Miscellaneous facilities:	
Awnings	5
Doors, louvre, ventilating	15
Incinerators	14
Safes and vaults.*	
Screens, window	10
Shades	5
Venetian blinds	8
Plumbing:	
Faucets and flushing valves	15
Bath tubs, lavatories, toilet bowls, etc	25
Pipes—	
Brass or copper.*	
Iron, cold-water	25
Iron, hot-water or steam	20
Sewer, cast-iron or vitrified.*	
Plumbing: (*cont'd*)	
Valves—	
Brass body, water or steam.*	
Iron body, water or steam	20
Pumps:	
Suction, pressure and sump	13
Roofs:	
Asbestos	25
Asphalt and tar (prepared)	15
Galvanised iron—	
Light or cold dipped	15
Heavy or hot dipped	20
Tar and gravel (5-ply)	20
Tarred felt	10
Copper, slate, tile, tin.*	
Starters, electric	20
Switchboards, electric	25
Tanks and vats, water:	
Metal	25
Wood	15
Telephone equipment:	
Conduits and fitting.*	
Wiring and fixtures	20
Tools, small, miscellaneous	5
Transformers	25
Trucks, conveyance (within building)	10
Trucks, lift	15
Voltmeters	15
Welfare equipment:	
Athletic	10
Cafeteria	10
Hospital and first aid	10
Police and fire	10
Wells and well pumps	25

---

*Life of building.

CONSTRUCTION EQUIPMENT

	Years
Automobiles:	
Light	2
Medium	3
Heavy	5
Backfillers, power:	
Light	3
Medium	5
Heavy	6
Tractor	5
Barges:	
Steel	30
Wood	25
Batcher plants:	
All steel, demountable	10
Steel frame, wood bin	10
Stationary	14
Wood frame and wood bin	7
Batch, measuring devices	4
Benders, bar	5
Bending blocks	10
Bending machines:	
Angle	15
Pipe	10
Rail	10
Bins:	
Steel, concrete	6
Steel	12
Wood	8
Bin frames, steel	6
Blacksmith shop outfits, portable	4
Blocks, pulley, differential	6
Blowers, mechanical	10
Boats:	
House	20
Motor	8
Boilers:	
Upright	7
Locomotive	15
Stationary	20
Borers (wood), portable	3
Boring apparatus, test	10
Boxes, mortar and batch	3
Brakes:	
Bending	10
Cornice (sheet metal)	22
Breakers, pavement, pneumatic	3
Buckets:	
Cableway	6
Clamshell	6
Concrete	5
Elevator	5
Orange peel	6
Bail, pivot turnover	5
Scraper or drag line	6
Buggies:	
Concrete	3
Timber	3
Building, job office or storage. (Life of job)	
Bulldozers:	
Gradebuilders	8
Tractor	4
Bunkers, stone portable, with screens	6
Burner equipment, gas and oil	12
Cables, wire	4
Cableways, cable only	3
Cableway carriage	5
Camping equipment	3
Capstans, electric	10
Cars:	
Ballast spreader	10
Batch box, steel	5
Boarding and tool	20
Concrete	8
Derrick, bridge	10
Dump, steel	8
Dump, wood	6
Flat, steel	12
Flat, wood	10
Hand	10
Hopper	10
Scale	10
Skip hoist	10
Tank	20
Carts, concrete	3
Carts, tool (steel)	4
Cement gun machines	4
Chains:	
Hawsers and lines	6
Power, transmission	5
Channelers, rock	6
Chipping and calking tools, pneumatic	3
Chutes, concrete, gravity	2
Clamps, column form	5
Cleaning machine for exterior of building, steam or sand	15
Compressors:	
Belt driven	10
Electric, portable	8
Gasoline, portable	6
Motor-truck unit	5
Steam portable	6
Concrete machines, pneumatic	5
Concrete mixers:	
Electric	5
Gasoline, 3½s, 5s, 7s	3
Gasoline, 10s, 14s	4
Gasoline, 21s, 28s	5
Paving, gas	8
Paving, steam	8
Steam	8
Truck mounted	5
Controllers, motor	12
Conveyors:	
Belt, elevating—	
Portable	3
Stationary	6
Bucket	6
Cable—	
Drag	6
Monorail	15
Chain, portable	6
Portable	5
Scraper	6
Cranes:	
Bridge and cantilever	20
Crawler—	
Electric—	
2½, 5 tons	5
10, 15 tons	7
20 tons and over	9
Gas—	
2½, 5 tons	5
10, 15 tons	9
20 tons and over	12
Locomotive gas	7
Steam—	
2½, 5 tons	6
10, 15 tons	10
20 tons and over	12
Locomotive	10
Dock or wharf, traveling	20
Dragline	10
Universal (gas, 2½ to 5 ton), mounted on 10-ton truck	6
Craneways:	
Steel	15
Wood	10
Crushers, rock:	
Portable	8
Stationary	10
Cutters:	
Bar, power	5
Corrugated iron, hand	10
Cutting and welding outfits, portable	4
Davits	15
Derricks:	
Boat	10
Circle swing, hand	8
Crab—	
Hand	16
Power	10
Guy—	
Steel	12
Wood	8
Stiffleg—	
Steel	12
Wood	8
Diggers, clay, pneumatic	8
Drag lines:	
Electric—	
½, ¾ cubic yard	6
1, 1¼, and 1½ cubic yards	8
2 cubic yards and over	10

FWDs GRADE ROADS FASTER AT LOWER COST

Equipped with underbody blade, an FWD four-wheel-drive truck is an outstanding road maintenance unit . . . fast, efficient, capable of patrolling great mileage at low cost. FWDs are engineered for this service, as well as for scores of other road construction and maintenance jobs. For more than 36 years they have proved that the true FWD four-wheel-drive principle, with center differential, gives them what it takes to be classed as the "ONE truck for MANY jobs" demanding the heaviest of heavy-duty performance in highway work, all year 'round.

See your nearest FWD Distributor, or write to . . .

THE FOUR WHEEL DRIVE AUTO CO.
CLINTONVILLE, WISCONSIN
Canadian Factory: KITCHENER, ONTARIO

America's
FWD
Foremost Heavy-Duty Truck

g Lines: (cont'd)	Years
Gasoline—	
½, ¾ cubic yard	5
1, 1¼ and 1½ cubic yard	9
2 cubic yards and over	12
Steam—	
½, ¾ cubic yard	6
1, 1¼ and 1½ cubic yards	10
2 cubic yards and over	12
redges:	
Clamshell	16
Dipper	8
Hydraulic	20
Pipe	10
rill boats	12
rill points, well	5
rills:	
Airdrifter	3
Electric or pneumatic, hand, for wood or metal	5
Hand, electric	3
Rock, electric	3
Jackhammer	3
Steam	5
Traction, well	7
Tripod	7
Tunnel carriage	5
Well	10
Drums for oil (steel)	10
Elevators:	
Bucket, stationary	6
Cage (steel tower)	5
Engines:	
Blowing	12
Fire	7
Gas	10
Marine	20
Oil	20
Plumbing	14
Steam	11
Excavators:	
Cableway, complete	4
Trench, gasoline—	
7-foot depth	6
12-foot depth	6
18-foot depth	8
Trench, steam—	
7-foot depth	8
12-foot depth	8
18-foot depth	10
Trench, vertical boom	5
Wheel or ladder type	5
Extinguishers, fiire	3
Fans, exhaust	15
Finishing machines	4
Floats, bridge (steel)	5
Forges, gas or oil burning	10
Forms:	
Concrete (metal pans)	5
Concrete, supports, adjustable	4
Steel, for—	
Pavements	4
Pipes	3
Roads	4
Tunnels and conduits	4
Walls	5
Furnaces, metal melting:	
Coal fired	10
Electric	12
Gas or oil	7
Generator sets:	
Steam engine	12
Turbine, headlight or floodlight	4
Gin poles (steel)	10
Gradebuilders (bulldozers)	8
Graders:	
Blade, road—	
7, 8 foot blade	4
9, 10 foot blade	5
over 10-foot blade	8
Elevating	8
Form, subgrade planers	6
Rooters, wheel	5
Grinders:	
Metal surface	15
Saw filers and setters	14
Surface, concrete	4
Hammers:	
Electric	3
Pneumatic riveting	3
Harness	4
Heaters, asphalt, tar, and pitch kettles.	4
Helmets, gas and diving suits and equipment	10
Hoists:	
Air, electric, or steam	8
Chain	6
Electric monorail or post	5
Gas	6
Hand power	8
Slew—	
Electric	8
Steam	12
Holders on pneumatic	4
Horses	5
Hose:	
Fire, linen or rubber lined cotton	5
Metal, flexible	10
Oil	5
Reel or cart	10
Rubber, air, steam or water	10
Inundators, batch	4
Inland craft:	
Graders, hydraulic	7
Quarter boats	10
Jacks:	
Hydraulic	8
Rail	25
Rachet	8
Jacks: (cont'd)	Years
Screw	5
Steamboat, push and pull	3
Jibs, steam	17
Jointers, bench, electric, steam or gas.	5
Ladders:	
Rope, wood rungs	2
Steel	3
Ladles, metal	7
Lathes:	
Metal working	15
Woodworking	17
Launches, gasoline	10
Levee construction equipment:	
Drag lines	8
Shovels	8
Tower excavators	12
Life-saving equipment	10
Light plant	4
Lighters	22
Loaders, bucket:	
Crawler	5
Portable	5
Stationary	6
Locomotive battery	4
Locomotives, industrial:	
Diesel	10
Electric	16
Gas—	
Up to 10 tons	8
10 to 20 tons	15
Over 20 tons	20
Steam—	
Up to 10 tons	8
10 to 20 tons	18
Over 20 tons	20
Locomotives, standard gage	30
Magnets, lifting	15
Milling machines	15
Mixers: portable mortar	3
Less than ½ cubic yard	6
Over ½ cubic yard	8
Caterpillar	8
Motors:	
AC and DC—	
Large	12
Medium	10
Small	8
Hydraulic	5
Pneumatic	5
Mowers, right of way	5
Mules	5
Pile drivers:	
Barge	8
Railroad outfits	10
Steam, on skids	10
Track	12
Pile hammers, steam or air:	
Heavy	10
Light	4
Medium	5
Pipe:	
Black or galvanized	4
Wood	5
Wood and steel combination	6
Pipe lines and fittings, for floating dredges	10
Pit and quarry plants	6
Planers:	
Metalworking	15
Woodworking	20
Plows:	
Furrow	3
Rooter	6
Pontoons	20
Presses, drill	12
Pumping units:	
Electric—	
Centrifugal	6
Diaphragm	6
Piston	6
Gas—	
Centrifugal	6
Diaphragm	6
Highway contractor's pump	4
Piston	5
Steam, centrifugal	10
Pumps:	
Air lift	10
Centrifugal	6
Humdinger	6
Impulse	6
Hydraulic	15
Oil	10
Steam piston unit	6
Testing for pipe lines	15
Punches, hydraulic	20
Punches for steel, power	15
Racks, storage, for pipe and steel:	
Steel	20
Wood	15
Rails, steel	10
Razing equipment, for buildings	8
Reamers:	
Electric	3
Pneumatic	3
Riveters, pneumatic	5
Rollers:	
Concrete finishing (steel)	10
Road, gas	10
Road, steam	10
Rolls, ridge	5
Rowboats	8
Sand-blast outfits	10
Sawmills, portable	10
Saws:	
Band, cut-off and rip, power	10
Hand, Electric and pneumatic	3
	Years
Saws and woodworkers:	
Steel frames	10
Wood frames	5
Scales, large, track and wagon	20
Scarifiers:	
Attachments	4
Blocks, steerable	5
Drag, all steel	4
Grader type	4
Scows	25
Scows, dump	25
Scrapers:	
Blade, carryall	6
Fresno or Morman	2
Rotary	4
Slip	2
Wheel	5
Screens and bunkers, for gravel pits only	5
Screens, revolving	6
Sharpeners, drill	8
Shears, for steel, hand	10
Shores, adjustable	4
Shovel attachments, for cranes	6
Shovels:	
Electric or gasoline, crawler or Wheel—	
½, ¾ cubic yard	5
1, 1¼, 1½ cubic yards	6
2 cubic yards and over	8
Steam, crawler or wheel—	
½, ¾ cubic yard	7
1, 1¼, 1½ cubic yard	8
2 cubic yards and over	10
Railroad, steam	10
Tunnel	4
Spouting plants, complete, concrete	4
Spraying equipment, paint	12
Spreaders, stone:	
Hopper wagon	5
Steel box	5
Steamers, paddle wheel	30
Switches:	
Portable	4
Stationary	5
Tampers, backfill, pneumatic	3
Tamping machines	10
Tanks:	
Gasoline, storage	6
Relay	6
Water or air, storage (steel)	10
Water storage (wood)	14
Tarpaulins and tents	3
Threading and cutting machines, pipe.	10
Ties:	
Steel	12
Wood	6
Tongs, chain	4
Towers:	
Cableway—	
Steel	6
Wood	3
Steel boom with counterweights	5
Tracks, industrial, portable	6
Tractors:	
Electric—	
3-ton	3
5-ton	5
10-ton	6
20-ton	8
Gas or steam—	
3-ton	4
5-ton	6
10-ton	8
20-ton	10
Trailers:	
Dump—	
Steel	10
Wood	10
Platform, wood	4
Drop platform, heavy duty	5
Transformers, car	10
Trenching machines. (See Excavators.)	
Trucks, auto:	
General purpose or dump—	
½-¾ cubic yard	3
1-1¾ cubic yards	5
2 cubic yards and over	8
Tugs, screw-propelled, steam or gas	25
Turntables, industrial railway	4
Vises	5
Wagons:	
Dump—	
Steel	6
Wood	6
Farm—	
Heavy	10
Light	10
Road oilers, tank, steel	10
Tank or sprinkler—	
Steel	10
Wood	8
Washers, gravel	3
Welding outfits, acetylene or electric	10
Wheelbarrows	2
Winches, electric and pneumatic	10
Wire and cables:	
Electric	6
Flexible, steel armored	8

BRIDGES

Concrete and steel or masonry, large	100
Concrete and steel or masonry, small	75
Steel, heavy	50
Steel, light	40

WATER SUPPLY

	Years
Impounding dams	150
Springs and wells	100
Infiltration galleries and tunnels	100
Collection conduits and reservoirs	75
Mains, cast iron:	
4-inch and less	50
6-inch	65
8 to 10-inch	75
12-inch and over	100
Settling basins	50
Coagulating basins	50
Filters	50
Steam engines	30
Internal combustion engines (Disel type)	25
Pumps	50
Stand pipes	50
Meters	30
Hydrants	50
General office equipment	19
General shop equipment	29
General store equipment	20
Laboratory equipment	10

ELECTRIC UTILITIES

Steam Production

	Years
Structures and improvements	50
Boiler plant equipment	28
Engines and engine driven generators	30
Turbo-generator units	30
Accessory electric equipment	28
Miscellaneous power plant equipment	28

Hydraulic Production

Structures and improvements	75
Reservoirs, dams and waterways	150
Waterwheels, turbines and generators	35
Accessory electric equipment	35
Miscellaneous power plant equipment	35
Roads, railroads and bridges	100

Transmission Plant

Structures and improvements	45
Station equipment	28
Towers and fixtures	50
Poles and fixtures	33
Overhead conductors and devices	50
Underground conduit	75
Underground conductors and devices	40
Roads and trails	60

Distribution Plant

Structures and improvements	45
Station equipment	28
Storage battery equipment	20
Poles, towers and fixtures	35
Overhead conductors and devices	33
Underground conduit	60
Underground conductors and devices	40
Line transformers	28
Services	28
Meters	28
Installations on customers' premises	25
Street lighting and signal systems	22

ARTIFICIAL GAS

Production Plant

	Years
Structures and improvements	50
Boiler plant equipment	30
Other power equipment	40
Benches and retorts	35
Coke ovens	35
Producer gas equipment	33
Water gas generating equipment	33
Petroleum gas equipment	33
Other gas generating equipment	33
Coal, coke, and ash handling equipment	40
Gas reforming equipment	33
Purification equipment	33
Residual refining equipment	40
Other production equipment	33

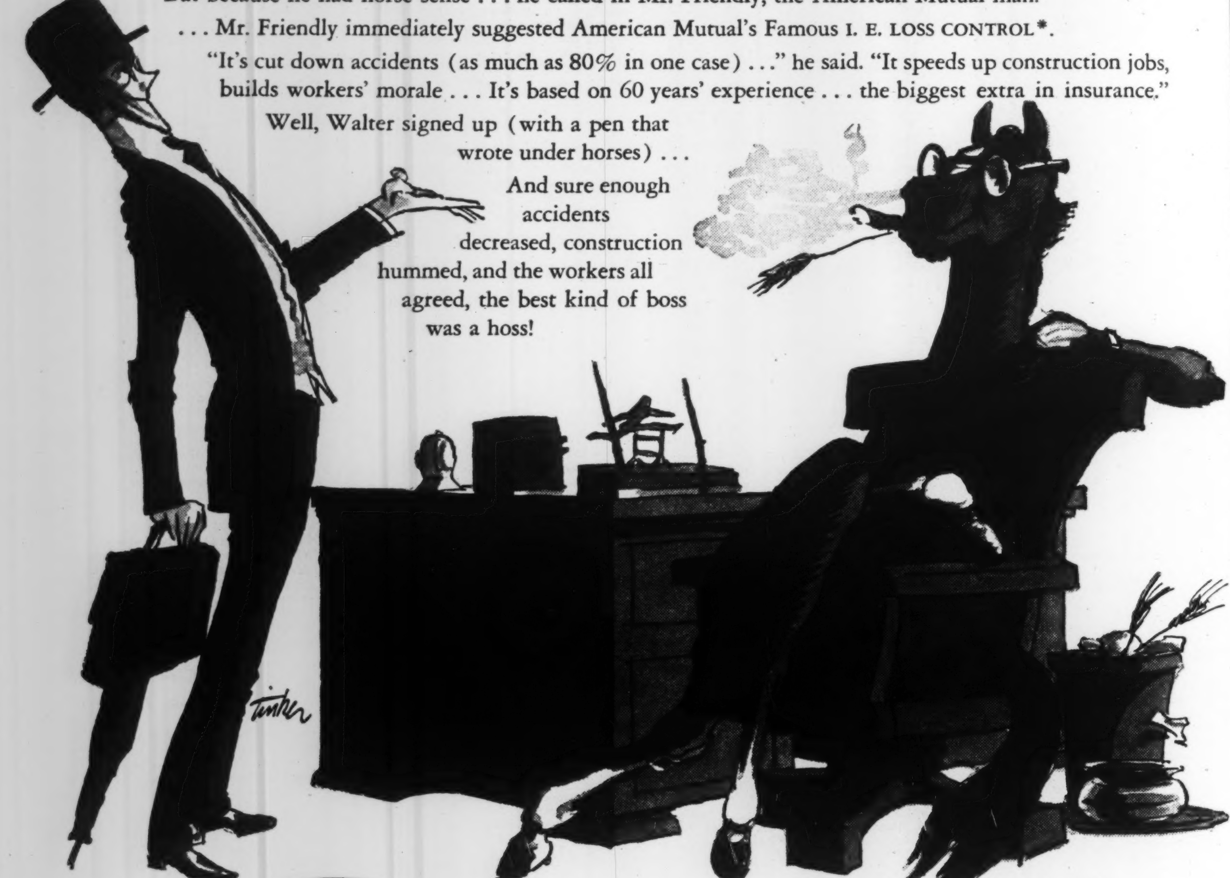
Distribution Plant

Structures and improvements	45
Mains	80
Cast iron pipe—	
4 inches and less	50
6 inches	65
8 to 10 inches	75
12 inches and over	100
Steel pipe—	
4 inches and less	30
5 to 7 inches	40
8 inches and over	50
Wrought iron pipe—	
¾ inches to 1½ inches	33
2 to 2½ inches	40
3 to 6 inches	50
8 to 10 inches	75
12 inch and over	100
Pumping and regulating equipment	35
Services	40
Meters	35
Meter installations	40
House regulators	40
House regulator installations	40
Other property on customers' premises.	33
Other distribution system equipment	35

The Horse who Lived the Life of Reilly!

by Mr. Friendly

One day, Contractor Reilly decided to change places with his horse, Walter . . .
"No worries," he said,"about worker accidents, slow construction . . .
nothin' to do but eat, sleep and gallop!"
Well . . . Walter, who was sick of hay . . . simply leaped at the chance!
Time passed . . . and Walter became neurotic. He started biting his hoofs . . .
he kicked the Foreman whenever he saw him . . .
But because he had horse sense . . . he called in Mr. Friendly, the American Mutual man.
. . . Mr. Friendly immediately suggested American Mutual's Famous I. E. LOSS CONTROL*.
"It's cut down accidents (as much as 80% in one case) . . ." he said. "It speeds up construction jobs, builds workers' morale . . . It's based on 60 years' experience . . . the biggest extra in insurance."
Well, Walter signed up (with a pen that wrote under horses) . . .
And sure enough accidents decreased, construction hummed, and the workers all agreed, the best kind of boss was a hoss!



Your helping hand when trouble comes!

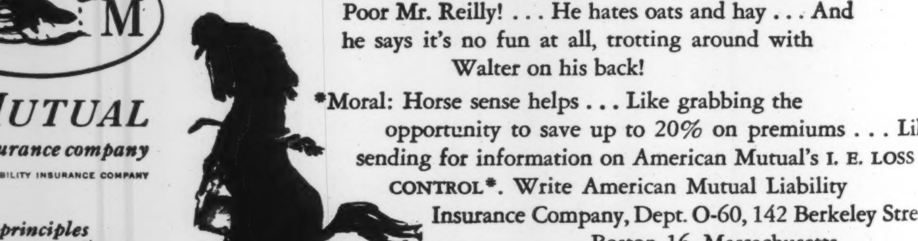
A M

AMERICAN MUTUAL
the first American liability insurance company
COPR. 1947, AMERICAN MUTUAL LIABILITY INSURANCE COMPANY

***Accident prevention based on principles of industrial engineering.**

Poor Mr. Reilly! . . . He hates oats and hay . . . And he says it's no fun at all, trotting around with Walter on his back!

Moral: Horse sense helps . . . Like grabbing the opportunity to save up to 20% on premiums . . . Like sending for information on American Mutual's I. E. LOSS CONTROL. Write American Mutual Liability Insurance Company, Dept. O-60, 142 Berkeley Street
Boston 16, Massachusetts.



BASE RATES ON COMPENSATION INSURANCE FOR CONSTRUCTION—APRIL 1, 1947

Data Compiled by Herbert L. Jamison & Co., Insurance Advisers and Auditors, New York, N. Y.

(Base rates in effect April 1, 1947—subject to increase or decrease according to experience ratings)

Classification of Work (A)	Ala. (N)	Alas.	Ariz.	Ark.	Cal.	Colo.	Conn.	Del.	D. C.	Fla.	Ga.	Idaho	Ill.	Ind.	Iowa	Kans. (N)	Ky.	La.	Me.	Md.	Mass.	Mich.	Minn.	Miss. (E)	Mo.	Mont.	Neb.
1. Carpentry — private residence	1.37	3.47	5.56	3.74	3.97	2.61	3.51	1.75	2.03	2.26	1.80	3.45	2.99	2.61	2.76	2.63	2.62	3.66	1.83	1.50	2.75	3.73	3.76	2.06	3.30	3.10	2.84
2. Carpentry — dwellings — 3 stories or less	1.37	3.95	5.56	3.98	3.97	2.61	3.51	1.75	2.03	2.26	1.83	3.45	2.99	2.61	2.76	2.63	2.62	3.72	1.83	1.89	2.75	3.73	3.76	2.06	3.30	3.10	2.84
3. Carpentry — interior trim	.81	2.34	5.56	2.27	3.97	1.10	1.85	1.75	1.51	.98	.94	1.70	1.16	1.04	1.16	1.15	1.08	1.59	1.25	1.42	1.65	1.98	3.76	1.49	3.30	1.51	1.37
4. Carpentry — general	1.98	7.94	5.56	7.77	3.97	2.73	4.76	1.75	2.65	2.26	3.61	5.04	3.53	3.11	2.76	3.65	3.76	3.84	5.33	2.56	6.19	3.73	3.76	7.44	3.30	5.13	2.85
5. Concrete and cement walk laying (B)	1.01	2.76	2.68	2.50	1.49	1.34	2.02	1.00	1.28	1.34	1.42	2.12	1.47	1.23	1.41	1.42	1.30	1.95	1.59	1.89	1.73	1.31	1.61	1.96	2.59	1.89	1.69
6. Concrete work — general (B)	2.03	7.14	6.33	4.31	3.43	3.03	5.10	1.50	3.88	2.52	2.16	5.61	3.05	2.13	3.26	3.41	2.71	4.01	2.75	2.39	4.01	3.61	3.63	7.50	5.48	4.65	3.11
7. Concrete work — dwellings — 3 stories or less (B)	1.06	6.75	6.33	3.16	3.43	2.47	3.17	1.50	3.50	1.82	1.10	2.76	2.04	1.33	1.64	1.90	1.20	2.40	2.78	2.83	4.56	1.43	2.56	4.31	3.00	2.44	2.18
8. Electric wiring	1.00	1.88	2.83	2.34	2.18	1.36	1.97	.90	1.29	1.31	1.29	1.92	1.26	1.24	1.65	1.22	1.20	1.35	1.24	1.38	1.32	1.46	1.36	1.76	2.09	1.70	1.98
9. Excavation — earth (C)	1.68	3.82	5.61	3.82	2.50	3.86	3.76	1.00	2.35	1.89	1.39	5.87	2.23	1.46	2.60	2.76	2.19	1.79	2.35	2.58	3.68	2.03	3.11	4.60	2.79	5.06	2.09
10. Excavation — rock (D)	2.87	9.09	11.33	7.65	6.51	3.83	6.52	1.00	4.78	3.85	3.18	6.77	4.38	3.73	3.86	4.14	4.39	5.45	4.03	3.99	7.90	4.70	5.38	7.45	7.56	5.69	5.09
11. Glazing	2.32	4.33	5.52	5.79	5.07	3.07	4.94	.60	3.36	3.07	2.49	5.04	3.27	2.99	3.13	3.31	3.16	4.35	3.39	3.21	3.80	3.48	4.18	2.78	4.91	4.54	3.82
12. Lathing	1.10	3.50	4.07	3.02	3.59	1.46	2.42	.70	1.61	1.27	1.23	(L)	1.43	1.41	1.51	1.56	1.49	2.09	1.66	1.56	2.39	1.83	1.79	1.85	3.37	2.09	1.83
13. Masonry	1.06	5.95	4.39	3.16	2.60	2.47	3.17	.80	1.89	1.82	1.10	2.76	2.20	1.33	1.64	1.90	1.20	2.40	2.78	1.96	4.56	1.43	2.56	4.31	3.00	2.44	2.18
14. Painting (J)	1.95	4.77	5.29	4.05	3.78	2.50	3.90	1.00	2.17	1.84	1.88	3.94	2.07	2.21	2.23	2.00	2.26	2.75	2.20	2.70	(K)12.77	2.66	2.77	2.31	4.13	3.56	3.03
15. Plastering	1.29	3.50	3.57	3.32	3.59	1.80	2.44	.70	1.98	1.62	1.15	2.86	1.90	1.86	1.78	1.91	1.72	2.27	2.01	1.97	2.84	1.73	2.28	1.81	2.94	2.54	2.22
16. Plumbing	.78	1.82	2.40	1.94	1.44	1.25	1.97	.60	1.40	1.01	.80	2.03	1.26	1.23	1.41	1.11	1.15	1.85	1.53	1.24	1.61	1.28	1.84	2.94	2.00	1.84	1.63
17. Roofing	3.58	8.95	9.78	9.95	8.02	5.35	9.98	1.20	5.62	3.95	3.25	9.71	5.79	4.64	7.24	6.53	4.73	6.69	6.52	6.36	8.90	7.93	8.40	5.81	7.16	8.76	7.73
18. Sheet metal erection	1.73	3.04	4.53	3.77	2.84	1.91	3.34	1.20	2.19	1.76	1.53	2.89	2.27	1.83	2.36	1.79	2.11	3.20	2.06	1.93	1.86	1.68	1.65	4.69	3.27	2.58	2.71
19. Steel erection — general	5.86	11.05	20.31	16.66	7.05	8.25	11.32	3.50	12.20	6.16	5.17	13.84	7.88	4.58	10.47	7.72	6.41	8.98	8.77	7.36	13.70	8.03	8.63	14.71	9.97	12.36	10.10
20. Steel erection — structural	9.50	19.60	20.31	19.41	12.54	13.37	13.15	3.50	15.40	8.95	7.82	19.51	9.03	7.06	13.25	11.72	10.04	8.98	10.77	10.22	16.37	18.45	8.63	20.24	20.98	17.81	13.85
21. Steel erection — interior ornamental	1.59	4.59	3.89	4.24	3.42	2.10	3.47	1.75	3.10	2.05	1.73	(L)	2.39	2.04	2.14	2.27	2.12	3.07	2.38	2.23	2.94	2.41	2.93	5.51	4.17	3.03	2.61
22. Steel erection — dwellings — 2 stories or less	3.74	10.77	20.31	10.89	12.54	5.07	8.18	3.50	5.34	4.98	4.67	8.71	5.84	4.09	5.02	5.89	5.81	7.21	6.62	5.15	13.70	7.45	6.83	10.48	10.37	8.19	5.95
23. Tile laying	.72	1.11	2.46	1.94	1.45	.94	1.63	.35	1.67	.92	.83	1.48	1.05	.91	1.00	1.00	.95	1.37	1.11	1.16	1.41	1.65	1.47	1.04	1.72	1.30	1.19
24. Watchmen and timekeepers (I)	1.61	5.95	1.99	3.56	(G)	2.16	3.59	(G)	2.35	2.13	1.83	3.33	2.54	2.04	2.23	2.27	2.11	3.10	2.44	2.24	3.10	2.58	2.97	4.06	4.20	2.99	2.67
25. Waterproofing																											
Application by means of brush	1.95	4.77	4.94	4.05	3.78	2.50	3.90	(L)	2.17	1.84	1.88	3.94	2.07	2.21	2.23	2.00	2.26	2.75	2.20	2.70	(K)12.77	2.66	2.77	(L)	4.13	3.56	3.03
Application by means of trowel (interior)	1.29	3.50	4.94	3.32	3.78	1.80	2.44	(L)	1.98	1.62	1.15	2.86	1.90	1.86	1.78	1.91	1.72	2.27	2.01	1.97	2.84	1.73	2.28	(L)	2.94	2.54	2.22
Application by means of trowel (exterior)	1.06	5.95	4.94	3.16	3.78	2.47	3.17	(L)	1.89	1.82	1.10	2.76	2.20	1.33	1.64	1.90	1.20	2.40	2.78	1.96	4.56	1.43	2.56	(L)	3.00	2.44	2.18
Application by means of pressure gun	2.03	7.14	4.94	4.31	3.78	3.03	5.10	(L)	3.88	2.52	2.16	5.61	3.05	2.13	3.26	3.41	2.71	4.01	2.75	2.39	4.01	3.61	3.63	(L)	5.48	4.65	3.11
26. Wrecking	9.25	15.99	28.43	23.12	19.11	12.39	19.06	10.00	13.44	12.34	9.49	(L)	11.82	8.48	12.52	10.12	12.32	20.57	13.60	14.14	16.32	28.74	13.11	18.35	18.14	18.17	15.27

Classification of Work (A)	Nev. (F)	N. H.	N. J.	N. M.	N. Y.	N. C.	N. D.(F)	Ohio (F)	Okla.	Ore. (H)	Pa.	R. I.	S. C.	S. D.	Tenn.	Tex.	Utah	Vt.	Va.	Wash. (H)	W. Va. (F)	Wis.	Wyo. (F)
1. Carpentry — private residence	State Insurance Plan Nevada Industrial Commission, Carson City, Nev.	2.01	5.00	1.79	5.66	1.91	North Dakota State Plan: Workmen's Compensation Bureau, Bismarck, N. D.	Ohio State Plan: Workmen's Compensation, The Industrial Commission of Ohio, Actuarial Section, Columbus, Ohio	5.07	6.36	1.70	5.65	3.23	1.69	2.17	2.42	2.39	2.13	1.42	4.59	West Virginia State Plan: State Compensation Commission, Charleston, W. Va.	4.04	Wyoming State Plan: Manager, Workmen's Compensation Dept., State Treasurer's Office, Cheyenne, Wyo.
2. Carpentry — dwellings — 3 stories or less		2.01	5.00	1.79	5.66	1.91			5.07	6.36	1.70	5.65	3.77	1.69	2.17	2.42	2.39	2.13	1.42	4.59		4.04	
3. Carpentry — interior trim		1.23	3.30	.87	5.66	1.36			2.58	2.94	1.70	4.25	1.85	1.03	1.18	1.91	2.39	.86	.93	1.50		4.04	
4. Carpentry — general		4.13	6.20	2.79	5.66	2.73			6.35	7.49	1.70	12.27	6.56	1.69	3.51	3.52	2.39	2.81	2.59	6.08		4.04	
5. Concrete and cement walk laying (B)		1.51	2.90	1.10	3.44	1.34			2.86	3.19	2.00	5.11	2.59	1.25	1.44	1.86	1.70	1.08	.93	2.30		2.12	
6. Concrete work — general (B)		4.49	7.60	2.31	5.34	3.01			7.72	6.69	3.00	6.96	7.08	2.32	2.05	3.52	4.56	2.34	2.17	5.15		3.51	
7. Concrete work — dwellings — 3 stories or less (B)		2.58	6.80	1.35	5.34	1.36			5.10	5.83	3.00	6.08	2.61	1.27	1.49	2.52	2.81	2.15	1.06	4.48		2.94	
8. Electric wiring		1.29	1.80	.94	3.07	1.36			2.51	3.29	1.20	2.91	2.43	1.08	1.22	1.78	1.40	.92	1.00	2.53		2.03	
9. Excavation — earth (C)		2.98	6.50	4.47	4.97	1.70			4.51	7.46	2.00	10.16	4.01	1.98	1.69	2.78	4.56	2.57	1.52	5.39		3.76	
10. Excavation — rock (D)		4.16	10.83	3.05	11.34	6.43			8.96	(L)	2.00	15.86	7.38	3.13	4.31	6.15	4.91	2.92	3.35	10.49		7.12	
11. Glazing		3.36	6.40	2.44	10.60	3.42			7.15	6.73	1.20	12.65	5.93	2.54	3.24	4.89	1.40	2.35	2.41	5.17		6.59	
12. Lathing		1.61	4.90	1.18	3.15	1.63			3.44	5.72	1.00	5.87	2.74	1.28	1.57	2.57	2.13	1.14	1.18	4.04		3.07	
13. Masonry		2.58	7.40	1.35	7.15	1.36			5.10	5.83	1.50	6.08	2.61	1.27	1.49	3.52	3.01	2.15	1.25	4.48		2.94	
14. Painting (J)		2.39	7.70	1.85	7.52	2.11			3.98	6.67	2.30	7.31	4.22	2.13	1.86	2.38	1.94	1.82	1.34	5.13		2.62	
15. Plastering		1.98	4.90	1.40	5.18	1.78			3.95	5.72	1.00	6.84	3.00	1.59	1.66	2.37	3.86	1.38	1.05	4.04		2.93	
16. Plumbing		1.56	3.00	1.19	3.27	1.14			2.20	2.91	1.05	3.21	2.00	1.30	1.12	1.86	1.06	1.24	.86	2.24		1.69	
17. Roofing		7.23	11.30	5.96	17.35	4.06			19.67	15.59	2.40	18.27	8.98	4.87	4.92	7.07	6.49	4.49	3.99	(L)		10.49	
18. Sheet metal erection		1.98	3.30	1.45	5.60	2.08			3.98	6.42	2.40	8.00	2.78	1.59	2.24	2.52	2.81	1.41	1.86	4.59		3.16	
19. Steel erection — general		8.90	13.10	6.09	15.68	11.33			16.47	(L)	6.50	35.06	14.90	6.16	7.07	8.55	10.51	6.14	5.34	12.98		8.66	
20. Steel erection — structural		12.43	18.90	9.66	26.11	13.74			23.51	25.39	6.50	44.27	22.04	8.72	9.67	12.62	10.51	8.57	7.28	19.52		10.63	
21. Steel erection — interior ornamental		2.29	(L)	1.69	4.84	2.32			5.04	5.94	3.00	8.53	3.87	1.84	2.27	3.54	2.10	1.61	1.67	4.57		3.71	
22. Steel erection — dwellings — 2 stories or less		6.06	10.20	4.32	13.10	5.53			11.41	12.19	6.50	21.87	10.66	3.71	5.55	8.55	6.96	4.16	4.08	9.53		6.37	
23. Tile laying		1.08	2.15	.78	4.35	1.01			2.25	2.10	.70	3.61	1.68	.91	1.05	1.52	2.66	.76	.79	1.62		1.45	
24. Watchmen and timekeepers (I)		2.33	(L)	1.71	8.02	2.32			5.02	5.45	(G)	8.40	3.35	1.96	2.31	(G)	2.79	1.66	1.74	4.69		4.22	
25. Waterproofing																							
Application by means of brush		2.39	6.20	1.85	7.52	2.11			3.98	4.70	(L)	7.31	4.22	2.13	1.86	2.38	1.94	1.82	1.34	(L)		2.62	
Application by means of trowel (interior)		1.98	6.20	1.40	5.18	1.78			3.95	4.70	(L)	6.84	3.00	1.59	1.66	2.37	3.86	1.38	1.05	(L)		2.93	
Application by means of trowel (exterior)		2.58	6.20	1.35	7.15	1.36			5.10	4.70	(L)	6.08	2.61	1.27	1.49	3.52	3.01	2.15	1.25	(L)		2.94	
Application by means of pressure gun		4.49	6.20	2.31	5.34	3.01			7.72	4.70	(L)	6.96	7.08	2.32	2.05	3.52	4.56	2.34	2.17	(L)		3.51	
26. Wrecking		13.48	28.00	9.83	(M)	13.69			25.59	32.43	17.00	43.30	22.91	10.35	11.57	20.85	26.28	9.40	10.08	....		23.15	

Notes: (A) Special rates for government projects. (B) Includes construction of forms. (C) Includes blasting, but not caisson or coffer dam work. (D) Special rates for occupational disease coverage. (E) Employer's liability rates — no compensation law. (F) Compensation must be insured in Monopolistic State Fund. (G) Assign operation to principal classification. (H) Operation specified as hazardous by law must be insured in State Fund. (I) Not available if general contractor is conducting operations at job. (J) Painting of bridges and steel structures rated as steel erection. (K) Work indoors — rate 1.45 in Mass. (L) Rate available only on application to company. (M) Wrecking of structures based on cubic content. (N) State rate revision pending.

Index of Construction Machinery Prices

The upward trend of the prices of construction machinery, which began in the last quarter of 1945, was continued throughout 1946. The index of the prices of construction machinery, as compiled by the Bureau of Labor Statistics and based on August, 1939 as 100, rose to 126.7 in December, 1946 from 114.2 in January, 1946, a rise of 11 percent. As compared with the index of 112.7 in October, 1945, when the first significant rise for the present upward movement occurred, the December, 1946 index showed a rise of approximately 12 percent.

The average index for 1946 as a whole rose to 120.7, or well above any preceding annual average since 1939. It showed a rise of 9 percent over the 1945 average of 111.2 and 19 percent over the 1940 average of 101.3. On a month to month basis, the largest gains during 1946 were made in April, May and October, when the index jumped 2.8, 2.8 and 2.1 points, respectively.

Price rises from December, 1945 to December, 1946 in the various types of construction machinery ranged from 9 to 17 percent. The price indexes of construction material processing equipment, which rose 17 percent, and portable air compressors, which rose 15 percent, showed the greatest increases.

The composite index for December, 1946 rose 27 percent above the August, 1939 average. Types of construction machinery showing greater than average gains from the August 1939 index were material processing equipment and track type tractors, rising 36 percent; and specialized construction machinery, rising 29 percent. Prices for tractor mounted construction equipment; power cranes, draglines, shovels and related equipment; and scrapers, maintainers and graders rose from 20 to 25 percent during this period. Equipment prices which advanced less than 20 percent included construction material mixers, pavers, spreaders and related equipment; drilling and boring machinery; and portable air compressors.

TABLE 1.—INDEX OF PRICES OF CONSTRUCTION MACHINERY

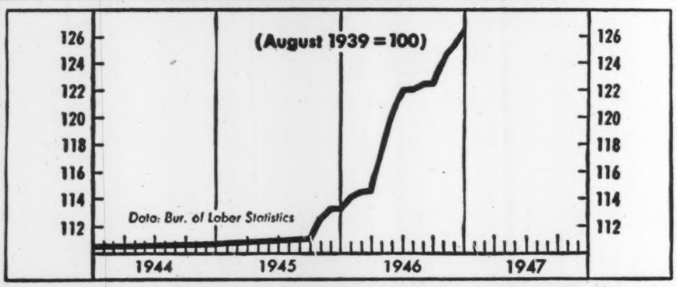
August 1939—December 1945—Bureau of Labor Statistics
(August 1939 = 100)

	1939	1940	1941	1942	1943	1944	1945	194
January	....	100.6	103.2	110.5	110.5	110.5	110.7	114
February	....	100.6	103.6	110.5	110.5	110.5	110.8	114
March	....	100.6	104.2	110.5	110.5	110.5	110.8	114
April	....	100.8	105.0	110.5	110.5	110.5	110.8	117
May	....	100.9	105.5	110.5	110.5	110.5	110.9	120
June	....	100.9	106.2	110.5	110.5	110.5	110.9	121
July	....	101.3	106.5	110.5	110.5	110.6	110.9	122
August	100.0	101.2	108.3	110.5	110.5	110.6	110.9	122
September	100.0	101.4	109.3	110.5	110.5	110.6	111.0	122
October	100.1	102.3	110.0	110.5	110.5	110.6	112.7	124
November	100.4	102.3	110.4	110.5	110.5	110.6	113.3	125
December	100.5	102.3	110.4	110.5	110.5	110.7	113.3	126.7
Yearly Average	....	101.3	107.0	110.5	110.5	110.6	111.2	120.7

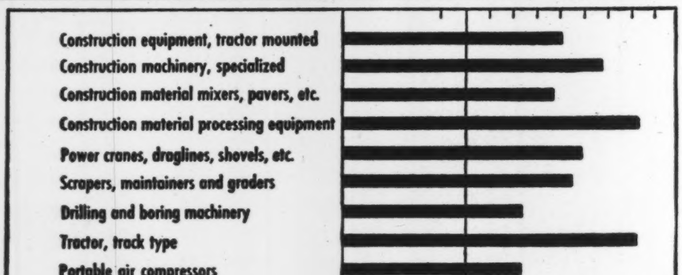
TABLE 2.—INDEX—BY GROUPS

	Aug. 1939	Dec. 1940	Oct. 1941	Dec. 1942	Dec. 1943	Dec. 1944	Dec. 1945	Dec. 1946
Constr. Equip., Tractor Mounted	100.0	100.3	108.8	108.8	108.8	109.7	110.5	120.2
Constr. Machinery, Specialized	100.0	101.1	110.8	111.5	111.8	111.8	113.6	128.6
Constr. Matl. Mixers, Pavers, Spreaders and Related Equip.	100.0	100.5	106.3	106.4	106.3	106.8	107.3	118.0
Construction Matl. Processing Equip.	100.0	100.6	110.9	112.7	112.7	112.7	116.6	136.4
Power Cranes, Draglines, Shovels and Related Equip.	100.0	101.4	110.5	110.9	110.9	110.9	112.5	124.7
Scrapers, Maintainers, and Graders	100.0	100.4	107.2	107.2	107.2	107.5	109.7	122.3
Drilling and Boring Machinery	100.0	100.0	100.0	100.0	100.0	100.0	100.0	112.0
Tractors, Track Type	100.0	106.0	113.4	114.4	114.4	114.4	120.1	136.0
Portable Air Compressors	100.0	100.7	100.0	98.4	97.9	97.9	97.6	111.9
Constr. Machinery—All Types	100.0	102.3	110.0	110.5	110.5	110.7	113.3	126.7

INDEX OF CONSTRUCTION MACHINERY PRICES FOR ALL GROUPS



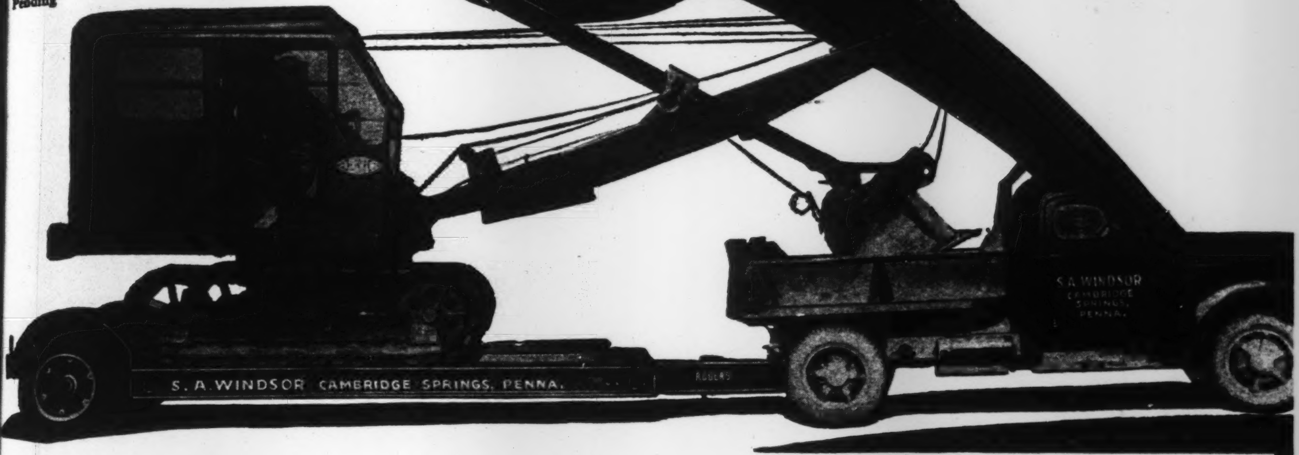
CONSTRUCTION MACHINERY PRICE INDEX, DECEMBER 1946

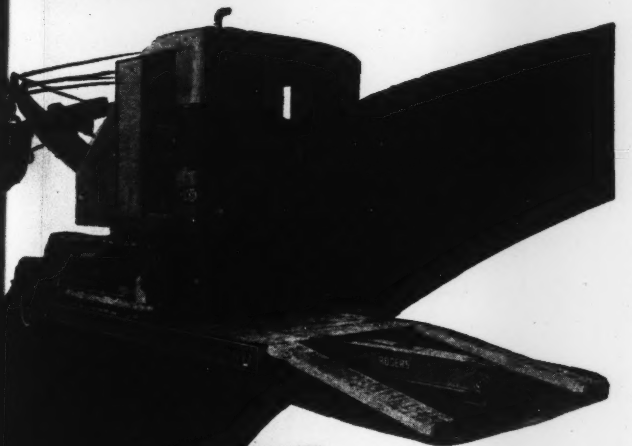


FRONTLOADER,

the New ROGERS TRAILER

Pending





TAGALONG FRONTLOADER, available in 10 and 20 ton capacity sizes, is an appropriate name for this new Rogers Trailer especially designed to haul small and medium equipment and be towed *by a dump truck.*

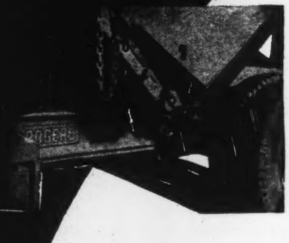
Equipment is loaded from the front—the dump body elevated to relax cable and engage sheave—then lowered to raise the drawbar which inserts towing tongue into drawbar.

With safety pin in place the trailer "tags along" at truck speed, getting equipment to and from jobs without delay—more quickly—and at a new low cost.

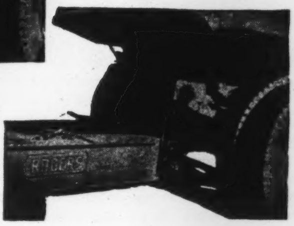
Write for information or mail the coupon below for extra prompt service.

The large catalog describing the general line of Rogers Trailers will also be mailed on request. Ask for it.

ROGERS BROTHERS CORPORATION
135 ORCHARD ST. • ALBION, PENNA.

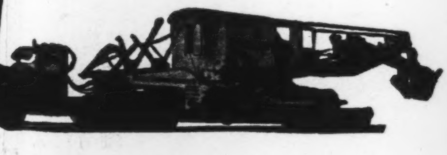


Body lowered to relax cable and permit engaging lifting sheave. (below)



Drawbar raised engaging towing tongue. Safety pin in place ready to "roll" when body is lowered. (above)

EXPERIENCE *builds 'em* — **PERFORMANCE** *sells 'em*



Heavy duty trailers available in all sizes for all purposes.

For Complete Information *Quickly mail this coupon*

Rogers Bros. Corp., 135 Orchard St., Albion, Pen
Gentlemen:
Please mail me the literature checked below
☐ the Tagalong Frontloader Trailer
☐ the General Catalog of Rogers Trailers

Name..

Address..City............

Company...

AIR PLUS JAEGER COMPRESSOR

get air costs down to today's Jaeger figures

Your Jaeger distributor is today supply headquarters for contractors in your locality who are applying modern *low-cost* air power to their work. He handles the finest air tools, engines and compressors on the market — he knows air — he is an important link in a chain of 128 Jaeger air stations across the U. S. and Canada which give on-the-spot service to contractors wherever their jobs may be.

Why Jaeger Air COSTS LESS

75% to 100% larger "Tough Swedish Twin" valves, ultra-lapped to leakproof closure — 20% to 30% slower, cooler piston speed — 100% efficient intercooling — force feed lubrication — balanced, precision parts — mean smoother, vibrationless performance, free air flow without the usual heat, carbon and power-wasting back pressure — more air from every pound and dollar of fuel and much lower upkeep with compressor units that outlast their original engines* 3-to1.

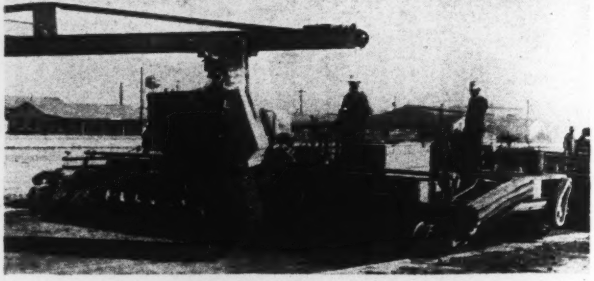
***Caterpillar, Continental, International power.**

Ask us for the name of your nearest air station and copy of Catalog JC-5, the up-to-date buyer's guide for portable compressors of 60 to 600 ft. size.

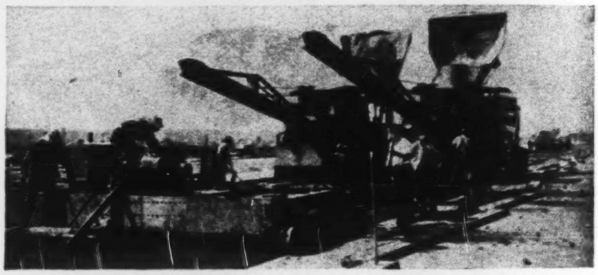
JAEGER EQUIPS YOU

for modern paving work

Julius Porath & Sons Co., Detroit, laying super-elevated curve of 35° maximum slope with ingenious strike-off mounted on Jaeger Finisher.



Jaeger Screw Spreader remixing as it places stiff material.



Jaeger High Speed Finisher sets fast pace for two big pavers.

When you buy paving equipment today, make sure it will equip you to meet the problems that are coming — entirely different specifications, new designs of pavements and paving materials presenting problems of remixing, of internal deep vibration, of laying new contours, of finishing new types of concrete — and always the problem of keeping your job costs below your estimates. Your Jaeger distributor knows the most modern paving machinery and its possibilities. Talk it over with him. You'll be ahead.

THE JAEGER MACHINE COMPANY

200 Dublin Avenue, Columbus 16, Ohio — Distributors in 120 Cities

REGIONAL OFFICES:	**8 E. 48th St. NEW YORK 17, N. Y.**	**226 N. LaSalle St. CHICAGO 1, ILL.**	**235-38 Martin Bldg. BIRMINGHAM 1, ALA.**

Construction Equipment Rental Rates

EQUIPMENT RENTAL RATES were established May 11, 1942 by the Maximum Price Regulation No. 134.

As revised under dates of Oct. 16 and Nov. 23, 1942, and Feb. 1, 1945, the regulation list dollar and cents maximum rental rates for month, week or day for machines common to construction. Rates given are for actual use of not more than 8 hours in a calendar day with a maximum of 50 percent added for use up to 16 hours and 100 percent up to 24 hours. Prices are for machines "bare" without fuel, lubricants or operators, or for repairs or maintenance charges.

Sample equipment rental rates from Maximum Price—Regulation No. 134 through Amendment No. 17

New schedule being compiled. Pending its release, add 10 percent to rates quoted below for approximate current practice.

	Per Month	Per Week	Per Day
Air Compressors			
Portable, gasoline 105–106 cu. ft. 100 psi	$185	$62	$15.50
Portable, gasoline 160–210 cu. ft. 100 psi	260	87	21.75
Portable, diesel 160–210 cu. ft. 100 psi	298	99	25.00
Portable, diesel 425–500 cu. ft. 100 psi	608	203	51.00
Stationary, electric 160–215 cu. ft. 100 psi	155	52	13.00
Stationary, electric 470–570 cu. ft. 100 psi	280	93	23.00
Stationary, electric 900–1200 cu. ft., low pressure	365	121	30.00
Air Tools			
Clay spades, small	20	10	2.50
Drifters	65	22	6.00
Hoists to 1500-lb. single-drum	50	18	4.50
Hoists, 1500–2500 lb. double-drum	80	27	6.50
Hose, over ⅝ in. 50-ft. length	6	3	1.50
Jack-hammer 51–68 lb.	35	12	3.00
Paving breakers 70–90 lb	35	15	3.50
Rivet hammers	25	10	3.50
Vibrators, concrete, rigid type	50	16⅔	4.25
Wagon drill (with air hoist)	165	50	10.00
Boilers			
Vertical 18–24 hp	75	25	6.25
Vertical 32–55 hp	100	33	8.50
Horizontal 55–70 hp	110	37	9.00
Horizontal 90–125 hp	175	58	15.00
Buckets			
Clamshell ⅜ cu. yd	67	22	5.50
Clamshell ¾ cu. yd	90	30	7.50
Clamshell 1½ cu. yd	140	46	11.50
Concrete bottom-dump 1 cu. yd	35	11⅔	3.00
Concrete bottom-dump 2 cu. yd	50	16⅔	4.25
Dragline 1 cu. yd	85	28	7.00
Dragline 1½ cu. yd	105	35	8.75
Dragline 2 cu. yd	125	42	10.50
Orangepeel 1¼ cu. yd	175	58	14.50
Bulldozers—see tractors			
Concrete carts 6 cu. ft. rubber tired	12	4	.....
Concrete carts 9–11 cu. ft. rubber tired	15	5	.....
Cranes (capacity at ft. radius)			
Crawler gasoline 4¾–7¾ ton 12	450	150	38.00
Crawler gasoline 14½–19½ ton 12	675	225	56.00
Crawler gasoline 18½–26 ton 20	1,400	467	117.00
Crawler diesel 14½–19½ ton 12	800	267	62.00
Crawler diesel 18½–26 ton 20	1,700	567	142.00
Crawler diesel 14½–20 ton 45	2,725	908	227.00
Crawler steam 18½–24½ ton 12	725	242	60.00
Locomotive gas 27–32 ton 12	1,300	430	108.00
Locomotive steam 27–32 ton 12	1,180	393	98.00
Truck-mounted gas 7–9 ton 10 (per hour $5.50)	700	230	58.25
Truck-mounted gas 12–14½ ton 10 (per hr. $6.00)	925	300	77.00
Crushers (without accessories or power)			
Openings 9x16	85	28	7.00
Openings 10x30	190	63	16.00
Openings 12x36	265	88	22.00
Derricks			
Stiff-leg wood 3½–4½ ton	100	33	8.50
Stiff-leg steel 4–6 ton 50–80 ft. boom	215	72	18.00
Stiff-leg steel 13–17 ton–100 ft. boom	390	130	33.00
Stiff-leg steel 32–42 ton 70–100 ft. boom	555	185	46.00
Guy 13–17 ton 70–110 ft. boom	245	82	20.00
Guy 35–45 ton 100-120 ft. boom	450	150	37.00
Engines			
Gasoline with clutch 22–30 hp	50	17	4.50
Gasoline with clutch 55–70 hp	90	30	7.50
Diesel with clutch 22–30 hp	75	25	6.50
Diesel with clutch 55–70 hp	135	45	11.00
Diesel with clutch 90–115 hp	245	82	20.00
Finegraders 11–16 ft. width (self-powered)	650	216⅔	70.75
Finishing machines			
Concrete-floor (powered)	60	20	5.00
Road finishers 12–18 ft. roadway	447	149	37.25
Road finishers 24–30 ft. roadway	495	165	41.25
Bituminous machines	750	250	63.00
Graders			
Single drive—8,600 to 14,000 lb. gasoline	275	92	23.00
Tandem drive 19,000–21,000 lb. gasoline	470	156	39.00
Tandem drive 18,500–21,500 lb. diesel	525	173	42.00
Towed-power operated 9–11 ft.	190	63	15.75
Pile hammers			
Drop 1,500–2,250 lb.	20	7	2.00
McKiernan-Terry #2	60	20	5.00
McKiernan-Terry #7	140	46⅔	11.75

Pile Hammers (Cont'd,)	Per Month	Per Week	Per Day
McKiernan-Terry #10B2 or 3	$270	$90	$22.50
Vulcan #1	290	96⅔	24.25
Vulcan #00	405	135	33.75
Vulcan Pile Extractor #800	220	73⅓	18.25
Tank Car Heater 2–3 car capacity	210	75	20.00
Hoists			
Gasoline single-drum 29–42 hp	95	32	8.00
Gasoline double-drum 22–28 hp	100	33	8.50
Gasoline double-drum 55–65 hp	175	58	15.00
Electric single-drum 17–27 hp	75	25	6.50
Electric double-drum 37–47 hp	138	46	11.50
Air 1,500–2,500 lb.	65	22	5.50
Chain 1½–2½ ton	20	7	2.00
Chain 4–6½ ton	30	10	2.50
Mixers, Bituminous			
Central Plant 30–50 ton per hr. (gradation control)	1,573	524	131.00
Central Plant 70–90 ton per hr. (gradation control)	2,217	739	185.00
Traveling Plant 1¼–1¾ cu. yd. per min	1,085	362	90.00
Mixers, Concrete			
Power charger 6S to 8½S	85	28	7.00
Power charger 12S to 16S	155	52	13.00
Batch hopper 25S to 30S	210	70	17.50
Paver 27-E, 1- and 2-drum	935	311⅔	78.00
Paver 34-E, single drum	1,335	445	111.25
Pumpcrete (concrete pump) gasoline			
Model 160 single cylinder (no remixer)	466	155⅓	38.75
Model 200 double cylinder (with remixer)	1,322	440⅔	110.25
Pumps			
Centrifugal, gasoline, 2 in. 7 to 10 M	40	13	3.00
Centrifugal, gasoline, 4 in. 30 to 40 M	80	27	7.00
Centrifugal, gasoline, 8 in. 125 M	195	65	16.00
Diaphragm force or open 3 in. double	50	17	5.00
Diaphragm force or open 4 in. double	60	20	5.00
Rollers			
Two-wheel tandem 5–9½ ton gasoline	250	83	21.00
Two-wheel tandem 12½–17½ ton gasoline	325	108	27.00
Three-wheel 5½–6½ ton gasoline	200	67	16.00
Three-wheel 7½–9 ton gasoline	270	90	22.00
Three-wheel 11–13 ton gasoline	425	142	35.00
Sheepsfoot, double drum	90	30	7.50
Sheepsfoot, triple drum	175	58	15.00
Shovels and back-hoes (dipper included)			
Crawler, gasoline ⅜ cu. yd	440	147	37.00
Crawler, gasoline ¾ cu. yd	605	201	50.00
Crawler, gasoline 1¼ cu. yd	880	293	73.00
Crawler, diesel ¾ cu. yd	715	238	60.00
Crawler, diesel 1¼ cu. yd	1,045	348	87.00
Crawler, diesel 2 cu. yd	1,980	660	165.00
Surveying instruments			
Levels	20	8	5.00
Transits	25	9	5.00
Tractor, crawler, and attachments			
33-41 hp. gasoline	265	88	22.00
66–85 hp. gasoline	425	142	35.00
46–52 hp. diesel	410	137	34.00
72–89 hp. diesel	645	215	54.00
89–135 hp. diesel	775	258	65.00
Winch, any size, double drum	75	25	6.50
Bulldozer 66–89 hp. tractor	120	40	10.00
Angledozer 66–89 hp. tractor	148	49	12.00
Tractors-wheeled			
4 wheel, rubber tired diesel 93–103 hp	530	175	45.00
4 wheel, rubber tired diesel 140–160 hp	855	285	70.00
2 wheel rubber tired diesel 145–160 hp	780	260	65.00
2 wheel rubber tired diesel 195–210 hp	1,385	461	115.00
Scrapers and Wagons (heaped measure)			
Scraper 7–10 cu. yd	250	85	21.00
Scraper 17–22 cu. yd	575	190	48.00
Scraper 29–37 cu. yd	1,025	340	85.00
Crawler wagons, bottom dump 9½–12½ cu. yd.	240	80	20.00
Crawler wagons, bottom dump 14½–20½ cu. yd.	370	123	31.00
Vibrators, gasoline, flexible shaft			
Up to 1½ hp. 28 ft. shafting	35	11⅔	3.00
3½–4½ hp., 46 ft. shafting	60	20	5.00
Welding Machines, wheels or skids			
Gasoline-engine driven up to 250 amp	74	25	6.00
Gasoline-engine driven 350 to 500 amp	114	38	9.50
60 cycle motor driven up to 250 amp	35	12	3.00
60 cycle motor driven 350 to 500 amp	56	19	4.50

Associated Equipment Distributors is preparing an Informational Handbook concerning construction equipment rental rates. Publication scheduled for May.

AVAILABLE
ATELY
DRAVO
COUNTERFLO
DIRECT FIRED
HEATER

Twenty-eight Dravo Counterflo Heaters start their journey from Pittsburgh to the West Coast. They will soon furnish heat for a new, modern automobile assembly plant in Southern California.

It is no longer necessary for buyers of industrial and commercial heating to take less than the best equipment in order to get prompt shipment.

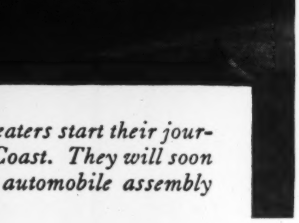
For open space heating Dravo Counterflo Direct-Fired Heaters are undisputed leaders in quality, efficiency and performance. This is proved through thousands of successful installations.

Now — due to greatly expanded production facilities —
Dravo Heaters are Available Immediately!

If you have a heating problem involving 400,000 Btu or more, look up the Dravo distributor in the "Heater Section" of your classified telephone directory —or write or call Heating Section, Dravo Corporation, 300 Penn Avenue, Pittsburgh 22, Pa.

DRAVO CORPORATION

PITTSBURGH • PHILADELPHIA • CLEVELAND • NEW YORK • DETROIT
WASHINGTON • WILMINGTON



Bulletin BT-516 free on request.

Cost of Financing

The downward trend of the cost of construction money, as measured by yields of high-grade bonds, was halted in April and May of 1946. Since that time, bond yields have shown some gains, with a tendency for yields to run above the level of a year ago in the latter part of 1946.

In February, 1947, however, yields of railroad bonds, public utility bonds, industrial bonds, and U. S. government bonds showed declines of 2.6 percent; 2.3 percent; 2.0 percent, and 1.3 percent, respectively, from the December, 1946 averages. The February, 1947 railroad bond yields averaged 2.58; public utility bonds, 2.56; industrial bonds, 2.47; and U. S. government bonds, 2.20. Municipal bond yields rose in February, 1947 to 1.99 from the December, 1946 average of 1.97, a gain of 1.0 percent.

Despite the setback in the first two months of 1947, bond yields in February this year were above a year ago. Municipal bond yields rose 33.6 percent from February, 1946 to February, 1947; public utility bond yields, 5.8 percent; industrial bond yields, 4.4 percent; and government bond yields, 3.8 percent. Railroad bond yields dropped 1.0 percent from February, 1946 to February, 1947.

The gains evident in the latter part of 1946 were not sufficient to raise the average for 1946 as a whole. As compared with 1945, U. S. government bond yields in 1946 showed a drop of 6.4 percent; railroad bond yields, 5.8 percent; public utility bond yields, 3.5 percent; industrial bond yields, 2.4 percent; and municipal bond yields, 1.8 percent.

Commercial loan rates charged by banks in principal cities during 1946 averaged 2.64 percent for the nineteen reporting cities. This was a gain of 1.1 percent over the 1945 average of 2.61. The commercial loan rates charged by eleven southern and western cities rose to 2.85 percent in 1946 from 2.73 percent in the preceding year, more than offsetting declines in other cities. The loan rates charged by banks in New York City dropped to 1.82 percent from 1.99 in 1945, and in seven northern and eastern cities to 2.43 percent from the 1945 rate of 2.51 percent, according to Federal Reserve Bank statistics.

Bond Yields—Percent

	Govt.* (1)	U. S. Treas. (2)	Municipal (3)	Industrial (4)	Pub. Util. (5)	Railroad (6)
1933		3.31	4.71	4.98	4.69	4.55
1934		3.12	4.03	4.28	4.19	4.01
1935		2.79	3.41	3.73	3.59	3.58
1936		2.69	3.07	3.34	3.38	3.31
1937		2.74	3.10	3.16	3.22	3.45
1938		2.61	2.91	2.82	2.99	3.60
1939		2.41	2.76	2.64	2.83	3.39
1940		2.26	2.50	2.57	2.75	3.26
1941		2.05	2.10	2.50	2.69	3.16
1942	2.27	2.09	2.36	2.54	2.71	3.17
1943	2.29	1.98	2.06	2.55	2.63	3.10
1944	2.38	1.92	1.86	2.58	2.64	3.01
1945	2.34	1.66	1.67	2.50	2.59	2.75
1946	2.19	Disc.	1.64	2.44	2.50	2.59
1946						
J	2.20		1.57	2.40	2.48	2.67
F	2.12		1.49	2.36	2.41	2.61
M	2.09		1.49	2.36	2.40	2.56
A	2.08		1.45	2.39	2.41	2.52
M	2.18		1.54	2.42	2.47	2.58
J	2.15		1.55	2.40	2.46	2.55
J	2.19		1.60	2.44	2.47	2.54
A	2.23		1.65	2.46	2.51	2.55
S	2.28		1.75	2.52	2.55	2.59
O	2.26		1.84	2.53	2.59	2.62
N	2.25		1.80	2.52	2.59	2.63
D	2.23		1.97	2.52	2.62	2.65
1947						
J	2.21		1.92	2.49	2.55	2.60
F	2.20		1.99	2.47	2.56	2.58

(1)* Standard Statistics & Poors—aver. long-term government bonds, taxable. To replace the long-term U. S. Treasury bonds series discontinued after December, 1945.

(2) Aver. yield of long-term U. S. Treasury bonds, partially tax exempt, not due or callable for fifteen years. Federal Reserve Bulletin.

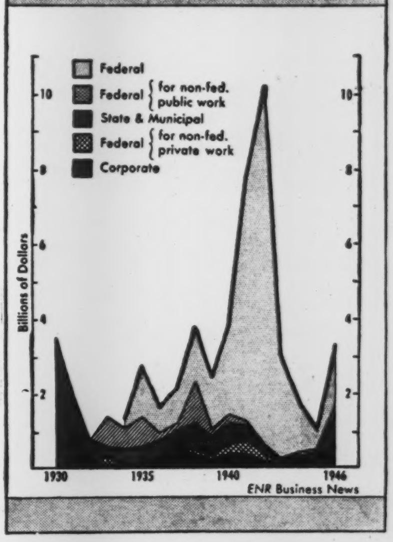
(3) Standard Statistics & Poors—aver. 15 high-grade long-term municipals.

(4) Standard Statistics & Poors—aver. A1 plu industrials.

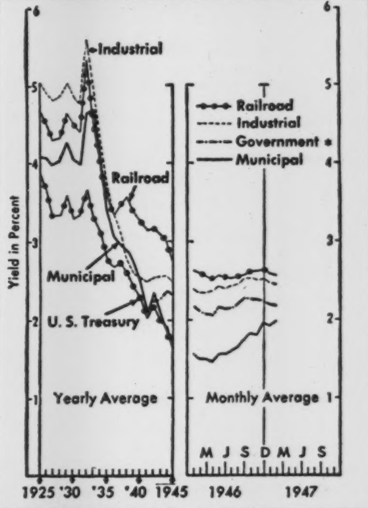
(5) Standard Statistics & Poors—aver. A1 plus public utilities.

(6) Standard Statistics & Poors—aver. A1 plus railroads.

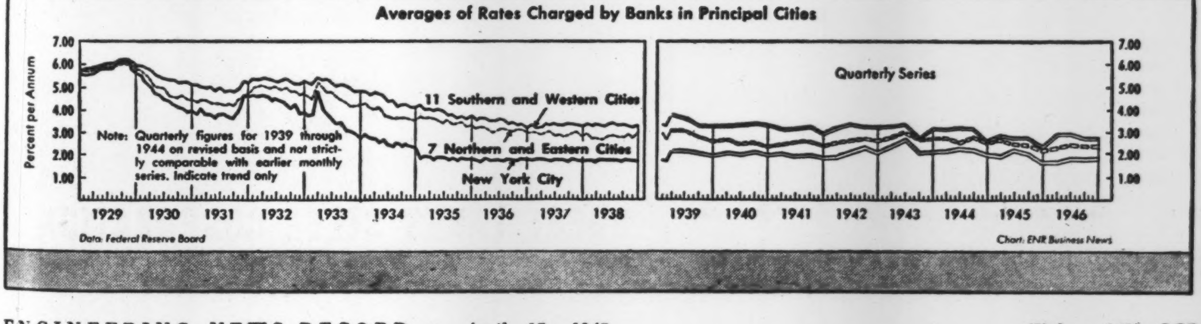
SOURCE AND VOLUME OF NEW CONSTRUCTION MONEY



COST OF FINANCING MEASURED BY HIGH-GRADE BOND YIELDS

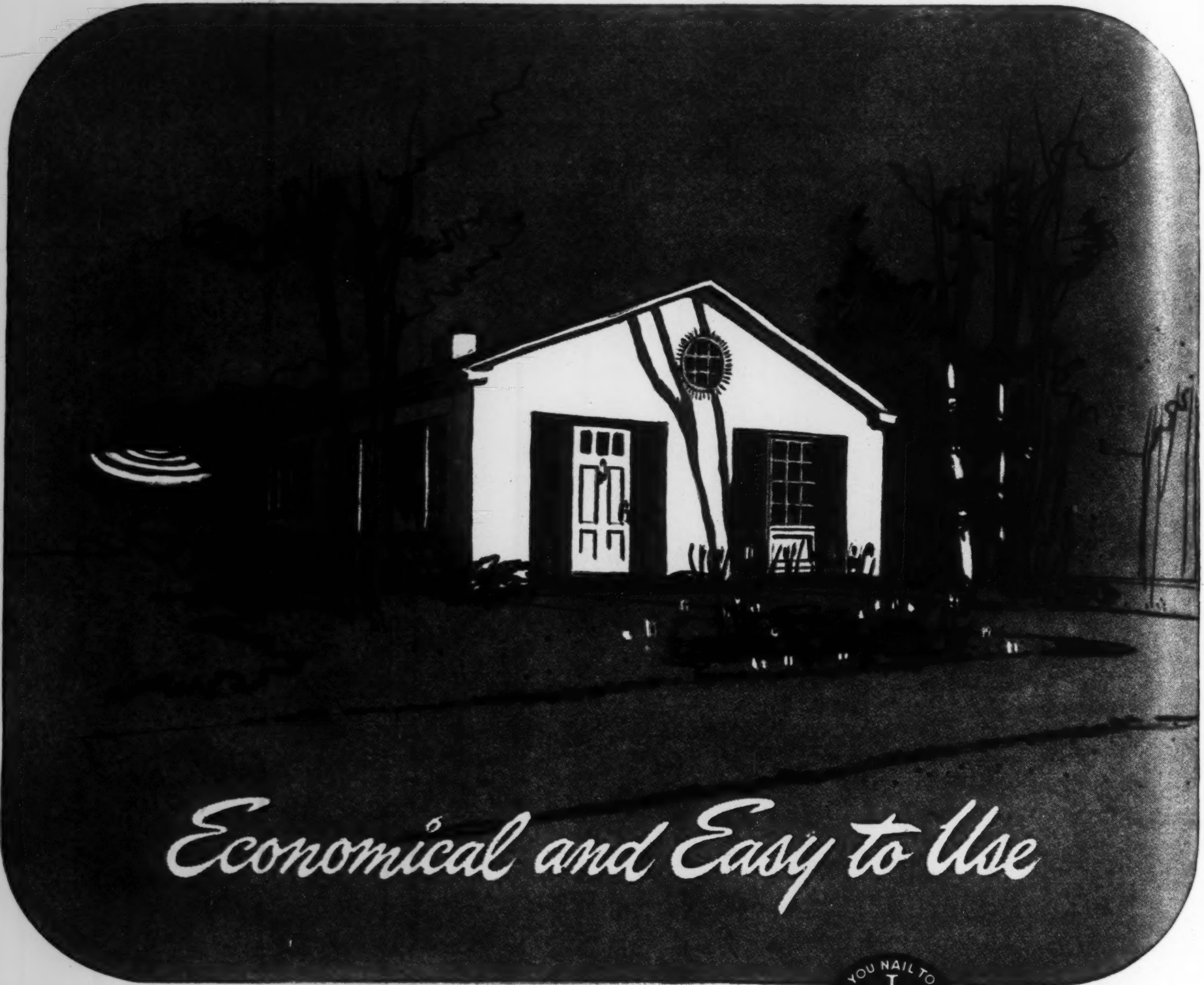


COMMERCIAL LOAN RATES



Data: Federal Reserve Board

Chart: ENR Business News


Economical and Easy to Use

Stran-Steel framing is a building product of Great Lakes Steel Corporation

YOU NAIL TO
STRAN STEEL
FRAMING

When they use Stran-Steel packaged framing for the first time, architects and builders alike are surprised that steel can be so easy to work with. Consisting of only a few basic types of framing members and fittings, the Stran-Steel system is simple and efficient. Yet it allows full flexibility of design. Practically any type of framing connection is possible, and any standard collaterals can be used.

Two unique construction features make Stran-Steel packaged framing ideally suited for light-load buildings. One is the fact that members can be quickly assembled with self-threading screws. The other is the patented *nailing groove*, an integral part of every Stran-Steel stud and joist. By means of this groove, collaterals can be nailed directly to the frame, just as easily as to wood.

By virtue of its efficiency, Stran-Steel is *economical.* To prospective owners it represents a sound investment in long building life, simplified maintenance and added fire protection.

BUILD WITH

STRAN STEEL

GREAT LAKES STEEL CORPORATION

Stran-Steel Division • Dept. 39 • Penobscot Building • Detroit 26, Michigan

UNIT OF NATIONAL STEEL CORPORATION

Index of Small House Costs

The index for measuring price variations of a moderate priced single-family dwelling is based by the Federal Home Loan Bank Administration, Division of Operating Statistics, upon a limited bill of specifications which reflects price changes of the more important building materials. The quantity and quality of the building materials and the number of work hours required of the various crafts to construct a six-room frame house is taken into consideration.

Although this hypothetical house is standard in the index, it is not typical in the sense of being a strict average of all the houses under construction at the time. Rather, it is a frame dwelling characteristic of the modest residential districts of many American cities. The dwelling specifies high quality materials but no extravagances and would sell in 1935 or 1936 in the vicinity of $5,500 excluding land and items of equipment which are not considered part of a general contract estimate.

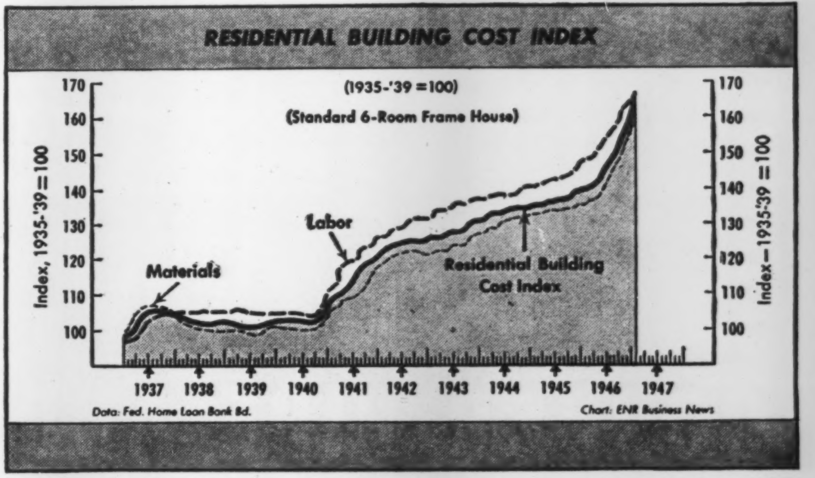
The house is a detached home of 24,000 cu. ft. volume, of good design, containing a living room, lavatory, dining room and kitchen on first floor, and three bedrooms and bath on second floor. An open attic may be used for storage or may be finished into one or two usable rooms. The cellar or basement is without partitions and contains heating plant and laundry facilities. Exterior treatment is assumed to be a combination of wideboard siding, with brick and stucco. A one-car attached garage is included. The plot is assumed to be approximately level with no unusual soil conditions. Materials, finish and workmanship specified are standard and typical of the practices of reputable small-house builders. Structural design meets all reasonable requirements of a municipal building code. Care was exercised to avoid all unusual practices.

The cost of small houses, as measured by the index based on 1935-1939 as 100, averaged 147.8 for 1946, a rise of 8 percent over the 1945 average of 137.4. The index rose from 139.7 in January, 1946 to 160.8 in December. The December index was 9 percent above the 1946 average. The material cost index rose from 135.5 in January, 1946 to 158.9 in December, or to a level 10 percent above the 1946 average of 144.1. The labor cost index of 164.8 in December, 1946 showed a gain of 6 percent over the 1946 average of 155.3.

Indexes of Building Costs for Standard 6-Room Frame House. Fed. Home Loan Bank Admin.

(1935-1939 = 100)

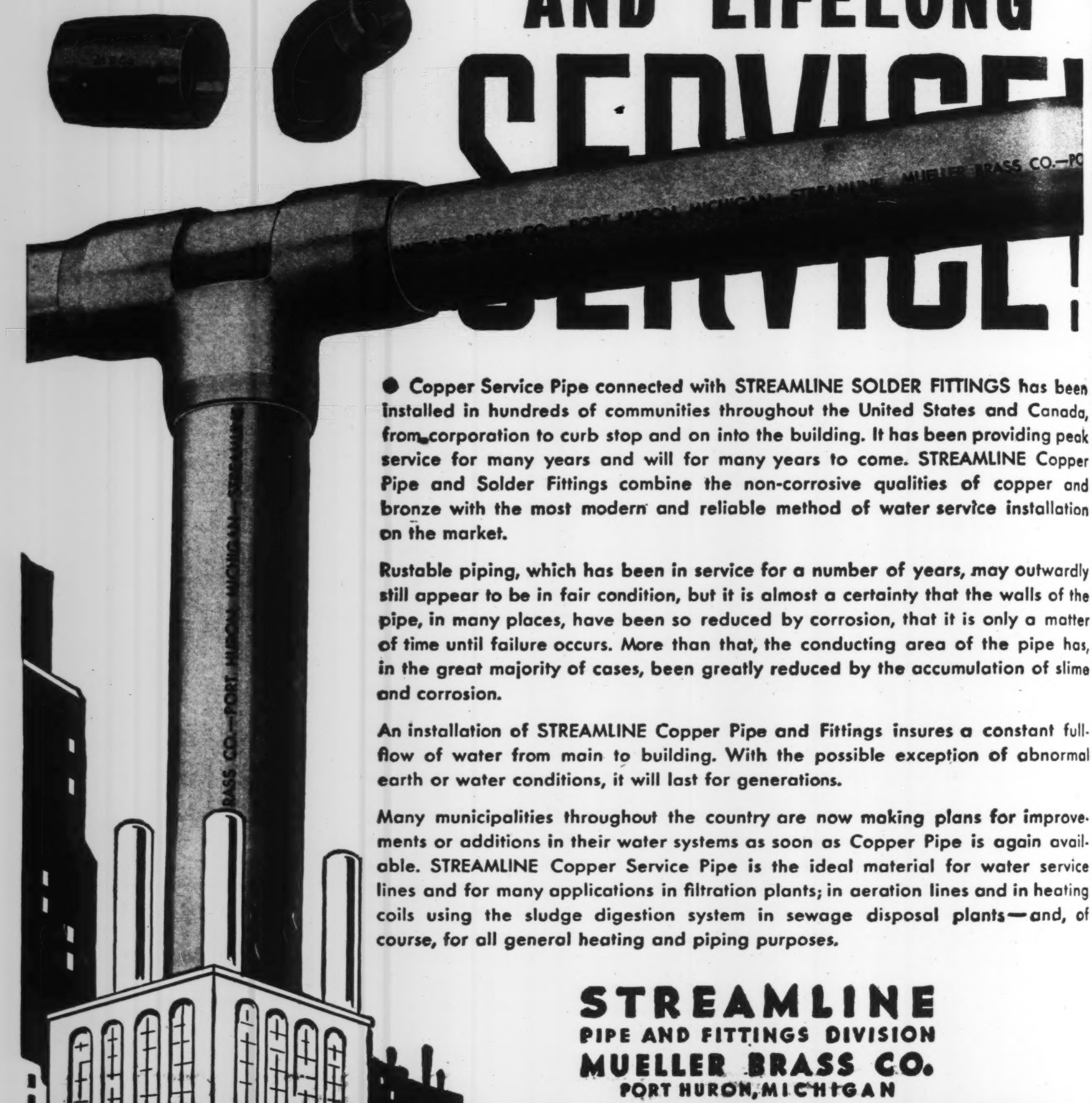
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Aver.
Combined Index													
1935......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	95.1	95.0	95.1
1936......	95.1	95.1	95.2	95.5	95.9	96.1	96.5	96.8	97.0	97.3	97.8	98.7	96.4
1937......	99.9	101.1	102.9	104.3	105.2	105.8	106.2	106.3	106.2	105.9	105.5	104.8	104.5
1938......	104.2	103.7	103.3	103.0	102.7	102.6	102.5	102.1	102.0	101.7	101.7	101.6	102.6
1939......	101.5	101.5	101.6	101.4	101.2	101.1	101.0	100.9	101.3	101.8	102.3	102.3	101.5
1940......	102.2	102.3	102.2	102.1	102.1	102.1	102.1	102.3	102.9	104.7	106.1	107.6	103.2
1941......	108.4	109.2	109.7	110.2	110.7	111.8	112.8	114.3	115.7	117.6	118.2	118.8	113.1
1942......	119.5	120.4	121.3	121.6	122.0	122.6	123.0	123.4	123.3	123.5	123.6	124.3	122.4
1943......	124.4	124.9	125.1	125.5	126.0	126.3	126.7	127.3	127.8	129.1	130.1	131.0	127.0
1944......	131.7	132.1	132.6	133.2	133.7	134.1	134.3	134.7	135.0	135.3	135.9	136.0	134.1
1945......	136.1	136.3	136.7	136.8	136.9	137.0	137.2	137.4	138.0	138.5	139.1	139.3	137.4
1946......	139.7	140.3	141.0	142.1	143.6	145.7	147.7	149.8	151.9	154.2	156.9	160.8	147.8
Material Index													
1935......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	95.9	95.8	95.8
1936......	95.9	96.1	96.2	96.3	96.5	96.7	97.0	97.4	97.5	97.8	98.3	99.5	97.1
1937......	101.0	102.6	104.6	106.0	106.7	107.0	107.2	107.3	107.0	106.5	105.9	105.0	105.6
1938......	104.1	103.4	102.6	102.1	101.7	101.5	101.2	100.5	100.4	100.3	100.2	100.0	101.5
1939......	99.9	99.9	99.9	99.8	99.6	99.5	99.4	99.3	99.9	100.5	101.3	101.4	100.0
1940......	101.3	101.3	101.3	101.1	101.2	101.2	101.1	101.3	101.9	103.3	104.5	105.7	102.1
1941......	106.4	107.2	107.9	108.2	108.4	109.0	110.2	112.1	113.8	115.7	116.3	117.1	111.0
1942......	118.0	119.0	119.7	120.1	120.4	120.5	120.7	120.8	121.1	121.2	121.4	121.4	120.4
1943......	121.3	121.5	121.7	121.9	122.4	122.6	123.1	123.8	124.5	126.1	127.2	128.1	123.7
1944......	128.8	129.4	129.8	130.4	130.9	131.4	131.6	132.1	132.2	132.2	132.4	132.5	131.2
1945......	132.5	132.8	133.1	133.2	133.4	133.5	133.8	133.9	134.1	134.6	135.0	135.2	133.8
1946......	135.5	136.3	137.1	138.0	139.2	141.6	143.7	146.1	148.3	150.5	153.8	158.9	144.1
Labor Index													
1935......	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	93.5	93.4	93.4
1936......	93.4	93.2	93.3	93.9	94.6	95.0	95.4	95.5	95.9	96.3	96.9	97.2	95.0
1937......	97.6	98.2	99.4	101.1	102.2	103.5	104.2	104.5	104.6	104.7	104.8	104.5	102.4
1938......	104.3	104.2	104.6	104.7	104.6	104.8	105.0	105.3	105.1	104.7	104.6	104.8	104.7
1939......	104.7	104.8	104.9	104.5	104.3	104.2	104.2	104.1	104.3	104.5	104.2	104.2	104.4
1940......	104.0	104.2	104.2	103.9	104.0	103.9	104.0	104.3	104.7	107.3	109.2	111.5	105.1
1941......	112.6	113.2	113.3	114.2	115.3	117.3	117.9	118.8	119.5	121.6	121.9	122.2	117.3
1942......	122.7	123.2	124.4	124.7	125.1	126.7	127.8	128.6	129.3	129.5	129.5	130.0	126.8
1943......	130.5	131.8	132.0	132.8	133.4	133.7	133.0	134.1	134.3	135.3	135.7	136.9	133.7
1944......	137.3	137.6	138.2	138.9	139.2	139.4	139.8	139.9	140.8	141.4	142.8	143.0	139.9
1945......	143.3	143.4	143.8	143.9	143.9	143.9	144.1	144.5	146.0	146.3	147.3	147.5	144.8
1946......	147.9	148.5	148.9	150.6	152.5	153.8	155.6	157.2	159.3	161.6	163.1	164.8	155.3



Data: Fed. Home Loan Bank Bd.

Chart: ENR Business News

FOR CONSTANT FULL FLOWING AND LIFELONG SERVICE!


MUELLER BRASS CO.—PORT HURON, MICHIGAN—STREAMLINE—MUELLER BRASS CO.—PO
BRASS CO.—PORT HURON, MICHIGAN—STREAMLINE

● Copper Service Pipe connected with STREAMLINE SOLDER FITTINGS has been installed in hundreds of communities throughout the United States and Canada, from corporation to curb stop and on into the building. It has been providing peak service for many years and will for many years to come. STREAMLINE Copper Pipe and Solder Fittings combine the non-corrosive qualities of copper and bronze with the most modern and reliable method of water service installation on the market.

Rustable piping, which has been in service for a number of years, may outwardly still appear to be in fair condition, but it is almost a certainty that the walls of the pipe, in many places, have been so reduced by corrosion, that it is only a matter of time until failure occurs. More than that, the conducting area of the pipe has, in the great majority of cases, been greatly reduced by the accumulation of slime and corrosion.

An installation of STREAMLINE Copper Pipe and Fittings insures a constant full-flow of water from main to building. With the possible exception of abnormal earth or water conditions, it will last for generations.

Many municipalities throughout the country are now making plans for improvements or additions in their water systems as soon as Copper Pipe is again available. STREAMLINE Copper Service Pipe is the ideal material for water service lines and for many applications in filtration plants; in aeration lines and in heating coils using the sludge digestion system in sewage disposal plants—and, of course, for all general heating and piping purposes.

STREAMLINE
PIPE AND FITTINGS DIVISION
MUELLER BRASS CO.
PORT HURON, MICHIGAN

STREAMLINE
TRADE MARK REG. U. S. PAT. OFFICE
COPPER PIPE AND FITTINGS

Cost Index for Standard House in 47 Cities — 1935-1939 = 100

Federal Home Loan Bank Board

FEDERAL HOME LOAN BANK DISTRICT AND CITY	1939				1943				1944				1945				1946			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
BOSTON: *																				
Hartford, Conn	100.5	100.1	100.0	101.1	128.2	128.2	130.3	134.5	134.6	135.1	135.2	136.5	136.8	136.8	137.3	137.9	137.5	144.1	147.4	156.2
Portland, Maine	99.0	99.6	98.8	98.6	129.8	134.7	140.9	144.6	146.7	148.2	151.4	152.4	152.5	152.5	152.5	153.5	153.8	164.8	169.9	179.2
Boston, Mass	102.3	100.9	101.7	103.1	128.3	126.9	128.6	130.2	130.5	132.8	133.2	133.2	133.4	133.6	133.6	134.2	137.9	140.8	147.1	157.3
Manchester, N. H	100.2	98.8	97.0	97.9	114.1	114.3	115.4	116.2	118.1	120.0	124.2	124.4	127.1	127.1	127.1	128.0	129.5	132.9	136.9	139.8
Providence, R. I	103.0	104.0	103.2	104.2	124.0	128.7	132.3	135.6	136.2	138.6	139.7	141.4	141.8	142.4	142.7	146.0	147.6	157.4	159.4	165.4
NEW YORK: †																				
Camden, N. J	101.9	103.7	101.8	106.5	138.1	137.3	136.4	135.6	138.8	140.7	143.6	.....	143.2	145.2	145.2	.....	158.6	.....	.....	.....
Newark, N. J	103.5	103.4	102.6	105.6	155.5	156.1	149.7	149.7	154.5	157.1	159.3	.....	159.7	161.9	161.9	.....	171.4	....	.....	.....
Albany, N. Y	99.5	101.6	100.4	101.9	130.2	130.4	137.6	140.6	140.6	140.4	143.8	.....	148.0	151.4	151.6	157.4	159.7	161.1	.....	.....
Buffalo, N. Y	102.0	100.2	99.2	104.7	128.2	130.8	130.2	134.7	135.8	140.0	142.1	144.6	144.6	149.4	147.1	149.2	149.6	151.6	166.0	175.4
PITTSBURGH: #																				
Wilmington, Del	103.7	100.7	97.5	97.0	129.2	129.2	130.0	130.8	133.4	134.2	134.9	134.9	134.9	136.2	137.0	137.9	138.5	141.6	143.1	154.9
Philadelphia, Pa	102.0	102.6	103.8	105.6	138.8	146.2	145.7	148.3	148.5	150.0	149.7	151.1	151.4	151.9	158.3	161.1	170.0	172.9	176.5	187.4
Pittsburgh, Pa	105.0	104.3	104.7	104.1	130.7	133.5	131.9	131.9	133.5	134.0	134.2	134.6	134.6	134.7	135.0	136.6	139.6	140.9	146.9	152.7
Charleston, W. Va	102.0	101.6	100.9	101.6	121.1	121.3	121.3	121.6	121.6	132.3	133.4	134.2	134.2	134.1	135.4	136.1	136.3	150.5	157.4	166.0
WINSTON-SALEM: *																				
Birmingham, Ala	100.9	98.1	97.1	99.2	115.6	118.8	121.6	124.0	126.0	126.5	128.4	128.5	128.5	127.4	127.4	127.6	132.0	135.6	139.9	154.7
Washington, D. C	105.8	102.9	104.4	104.4	131.2	133.4	134.5	138.9	139.1	141.4	142.8	143.3	144.4	144.5	144.5	150.4	153.1	159.2	169.7	174.6
Atlanta, Ga	96.5	95.5	94.9	97.5	130.1	130.1	134.8	137.7	140.3	142.5	143.8	146.4	145.8	145.7	148.3	151.7	153.5	158.0	160.8	180.8
Baltimore, Md	101.4	100.8	100.0	102.1	132.4	141.3	142.7	146.4	147.2	148.8	148.8	150.1	150.2	150.5	152.7	155.8	156.8	162.7	179.6	191.7
Richmond, Va	100.9	98.0	98.9	98.4	118.4	120.7	123.0	125.5	127.3	130.2	130.2	133.1	133.5	133.5	133.8	135.9	136.7	145.8	151.8	160.3
CINCINNATI: #																				
Louisville, Ky	100.8	101.0	100.7	104.0	119.9	121.2	122.0	126.2	126.5	133.7	134.3	134.7	135.2	136.3	135.7	138.4	142.9	146.0	148.9	152.1
Cincinnati, Ohio	96.3	96.6	96.3	97.4	119.1	121.8	124.2	130.7	131.2	133.9	.....	134.6	137.7	138.2	138.3	138.2	140.1	141.0	146.1	152.2
Cleveland, Ohio	101.1	101.9	102.1	107.6	128.3	128.9	138.5	142.3	139.5	142.6	142.6	147.8	147.9	147.5	148.1	149.2	145.9	147.0	159.6	163.1
Memphis, Tenn	104.7	102.5	101.2	104.0	120.1	120.1	121.7	133.7	134.4	134.4	135.3	135.6	136.0	136.9	137.7	139.9	141.3	141.6	147.3	154.1
INDIANAPOLIS: †																				
Indianapolis, Ind	102.7	105.2	105.2	101.2	121.2	121.6	121.3	126.0	133.9	134.2	136.6	137.3	138.1	139.5	140.5	141.6	141.7	142.7	146.5	148.2
Detroit, Mich	108.3	107.2	107.2	104.0	126.5	128.8	129.8	142.1	147.7	149.6	152.6	152.1	152.3	152.9	153.6	153.4	156.3	160.7	162.7	171.2
CHICAGO:*																				
Chicago, Ill.	100.0	100.3	99.1	99.4	109.1	109.5	110.3	111.3	112.3	112.0	112.0	112.4	112.4	112.6	115.3	117.2	121.8	124.8	130.2	134.9
Milwaukee, Wis	106.7	107.0	106.2	107.9	131.5	131.5	133.9	137.9	141.3	142.3	142.1	142.4	142.3	144.4	145.8	146.9	148.1	155.1	159.6	166.0
DES MOINES: †																				
Des Moines, Iowa	101.6	101.6	101.8	102.0	116.3	116.1	116.1	116.0	118.3	118.4	121.1	120.9	120.7	120.8	120.8	121.4	121.5	122.7	124.9	140.4
St. Louis, Mo	98.5	98.0	96.4	98.0	120.6	120.6	118.8	119.0	119.2	123.1	122.7	124.4	126.4	126.9	132.9	149.5	150.3	148.8	161.8	164.9
Fargo, N. D	99.1	99.0	98.1	102.3	121.1	122.3	122.3	122.4	123.9	124.7	125.1	125.7	126.7	128.3	127.8	128.1	128.1	129.5	134.4	137.8
Sioux Falls, S. D	105.1	104.0	100.8	101.4	124.3	126.2	126.2	126.5	127.7	127.7	130.4	130.8	130.8	131.9	133.0	133.1	133.8	135.9	143.8	148.7
LITTLE ROCK: #																				
Little Rock, Ark	101.6	102.1	102.7	103.2	134.6	134.7	135.0	135.4	135.4	137.6	138.1	138.5	138.4	139.0	138.8	140.9	142.3	145.4	154.9	163.1
New Orleans, La	102.2	101.2	101.4	105.3	131.3	131.3	131.4	138.4	141.3	141.2	141.2	141.7	141.9	141.9	141.9	142.7	143.1	150.2	155.2	160.5
Jackson, Miss	105.1	103.3	103.0	105.1	123.4	123.5	123.9	129.2	132.3	136.8	137.2	137.2	137.2	139.0	139.2	141.1	141.6	141.7	148.6	156.8
Albuquerque, N. M	103.0	103.5	103.5	104.8	117.0	117.7	118.7	130.9	133.8	133.9	130.9	132.0	134.7	132.0	132.3	132.5	133.9	137.6	148.6	152.2
Houston, Texas	100.6	100.7	100.2	99.9	116.2	116.2	116.5	121.5	123.1	123.6	126.7	126.8	126.4	126.8	126.8	128.6	132.3	135.5	138.1	146.5
TOPEKA: *																				
Denver, Colo	101.0	101.4	99.8	98.9	112.9	112.9	115.9	119.6	120.1	122.5	122.8	125.3	128.0	128.2	127.3	129.1	132.1	136.5	141.8	147.0
Wichita, Kan	109.1	108.0	107.7	103.9	127.5	129.0	129.1	131.9	133.2	134.4	135.7	135.9	135.9	136.7	136.8	137.3	138.1	140.2	144.1	151.6
Omaha, Neb	100.4	100.3	103.1	105.5	126.4	126.3	126.4	129.6	131.2	133.3	134.0	134.5	136.3	137.3	137.3	139.9	140.5	142.4	152.3	155.6
Oklahoma City, Okla	104.7	104.3	104.9	106.8	133.0	133.3	144.3	147.1	148.2	149.4	149.4	151.3	151.3	151.4	151.5	153.3	162.3	165.2	175.1	180.4
PORTLAND: †																				
Boise, Idaho	103.8	104.6	103.4	103.8	125.9	126.4	126.9	127.2	133.1	136.8	137.1	139.1	138.1	138.1	138.9	138.9	138.9	138.9	141.2	143.8
Portland, Ore	98.6	95.8	95.4	97.0	133.9	133.0	132.6	132.0	138.5	140.9	140.9	143.6	143.4	143.4	141.5	142.4	142.5	151.5	159.7	168.8
Salt Lake City, Utah	100.5	103.0	102.8	102.5	119.7	122.8	122.9	122.3	123.3	126.8	126.8	129.7	129.7	129.1	129.5	130.4	130.5	132.0	138.2	141.5
Seattle, Wash	102.2	102.7	101.9	102.8	124.4	126.6	131.0	132.5	131.9	133.7	134.6	138.9	138.9	138.9	139.6	135.3	135.7	137.9	142.9	147.5
LOS ANGELES: †																				
Phoenix, Ariz	98.3	96.5	97.9	99.4	111.4	111.5	111.5	112.5	118.5	118.0	122.0	122.0	122.3	122.4	122.3	121.9	121.9	122.9	124.8	128.9
Los Angeles, Calif	98.2	96.0	95.0	96.3	130.9	132.9	133.5	141.6	146.5	148.2	148.9	151.3	150.9	151.4	151.9	153.7	153.7	161.4	169.3	173.0
San Francisco, Calif	103.8	103.1	102.5	102.3	.....	.....	.....	.....	128.4	134.5	134.5	135.8	135.1	136.3	136.1	136.5	138.4	141.1	147.0	151.4
Reno, Nevada	102.3	102.1	102.3	104.3	119.2	120.6	120.7	119.9	124.6	127.5	133.0	132.9	133.0	133.0	133.1	133.5	130.8	133.9	143.0	150.7

* Boston, Winston-Salem, Chicago, Topeka reporting dates: March, June, September, December. † New York, Indianapolis, Des Moines, Portland, Los Angeles reporting dates: January, April, July, October. # Pittsburgh, Cincinnati, Little Rock reporting dates: February, May, August, November.

Off went the Boiler— Down went the Costs

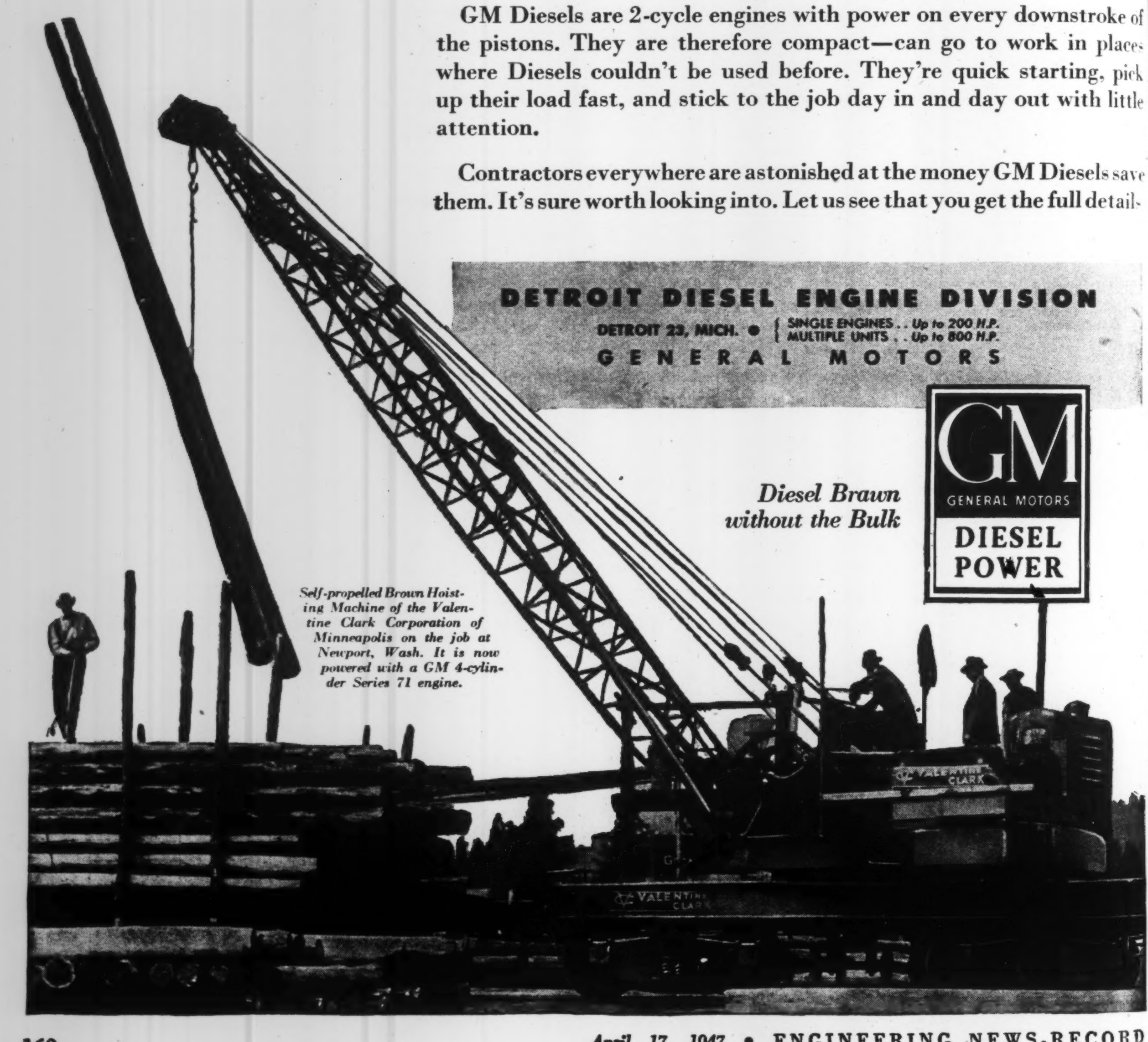
When Valentine Clark changed its log handler from steam to Diesel power, a lot of things happened.

First, $60 a week was saved on boiler tending. Maintenance nose-dived. The machine was always ready at the touch of a button. And, very important, a dangerous fire hazard was ended.

All this just emphasizes the money to be saved and the advantages to be gained by using General Motors Diesel power.

GM Diesels are 2-cycle engines with power on every downstroke of the pistons. They are therefore compact—can go to work in places where Diesels couldn't be used before. They're quick starting, pick up their load fast, and stick to the job day in and day out with little attention.

Contractors everywhere are astonished at the money GM Diesels save them. It's sure worth looking into. Let us see that you get the full details



Self-propelled Brown Hoisting Machine of the Valentine Clark Corporation of Minneapolis on the job at Newport, Wash. It is now powered with a GM 4-cylinder Series 71 engine.

DETROIT DIESEL ENGINE DIVISION

DETROIT 23, MICH. • SINGLE ENGINES . . Up to 200 H.P.
MULTIPLE UNITS . . Up to 800 H.P.

GENERAL MOTORS

Diesel Brawn without the Bulk

GM
GENERAL MOTORS
DIESEL POWER

Contract Unit Bid Prices

Selected list of 44 projects showing how contractors bid in 1946-1947

INDEX TO PROJECTS COVERED

WATERWORKS

Project — Page
Merriman Dam, New York 161
Improvements to Water Purification Plant, Dallas, Texas 161
Water and Sewer Extensions, Roanoke Rapids, North Carolina 165
Water Lines, Stoneham, Massachusetts 165
Water Supply Line and Weir Houses, Provo, Utah 165

SEWERAGE

Sewage Treatment Plant, Houston, Texas 167
Storm Sewer Improvements, Oklahoma City, Oklahoma 167
Sewage Treatment Plant near Quincy, Massachusetts 169
Intercepting Sewer, Chicago, Illinois 169
Sanitary Sewer Extensions, Hoisington, Kansas 171
Outfall Sewer Line Extensions, Sacramento County, California 171

AIRPORTS

Airport Improvements, Toledo, Ohio 171
Grading at Municipal Airport, Idlewild, New York 173

STREETS AND HIGHWAYS

Project — Page
Highway and Culvert, Adam County, Ohio 173
Road Improvement, West Virginia 175
Highway to Garrison Dam Site, North Dakota 177
Bituminous Concrete Road, Brewer, Maine 177
Surfacing, St. Helens Highway, Washington 177
Bay Shore Freeway, San Mateo County, California 179
Earth Road, Salt Lake County, Utah 179
Gravel Road, Norway and Waterford, Maine 179
Highway, Huntington County, Pennsylvania 181
Street Improvement, Oklahoma City, Oklahoma 181

BRIDGES

Brooklyn–Queens Connecting Highway, New York 183
Bridge over Stony Creek, Anne Arundel County, Maryland 185
Bridge, Monroe County, Indiana 185
Bridge and Substructures, Kern County, California 187
Schooner Creek Bridge, Lincoln County, Oregon 187
Three Bridges over Caney River, Oklahoma 187
Bridge, Cherryvale, Kansas 189

EARTHWORKS

Project — Page
Sea Wall, Hampton, New Hampshire 189
Guide Walls, Landward Lock, Hastings, Minnesota 189
Spillment and Embankment, Blue Mountain Dam, Arkansas 193
Grenada Dam, Mississippi 193
Potholes Dam, Columbia Basin Project, Washington 195
Allatoona Dam and Powerhouse, Georgia 196
Core Drilling at Hogan Dam, near Valley Springs, California 201
Floodwall, New Orleans, Louisiana 201

MISCELLANEOUS

Dearborn St. Subway, Chicago, Illinois 203
Platform Extensions to I. R. T. Subway Stations, New York City 203
Railroad for Garrison Dam, North Dakota 205
Transmission and Distribution Lines for Boysen Unit, Wyoming 207
Warehouse Building at Hungry Horse Government Camp, Kalispell, Montana 207
Tunnel Shaft, Governor's Island, New York 208

Improvements to Bachman Water Purification Plant, Dallas, Texas

OWNER: City of Dallas, Texas, Dept. of Waterworks.

PROJECT: Additions and improvements to Bachman Water Purification Plant, consisting of primary basin no. 3, flocculator, mixer, and appurtenant work. Plant is located 6 miles northwest of the business district of Dallas, Texas.

CONDITIONS: The Denton Branch of the Missouri, Kansas, and Texas Railroad provides access to the job site. Contract time is 230 calendar days. Stipulated wage rates are: plumbers, $1.75; electricians, $1.625; power shovel operators, $1.625; carpenters, $1.425; concrete mixer operator (less than 5 sack size), $1.375; pump operator, $1.125; pipe fitter, $.75; pipe layer, $.75; and common labor, $.70.

BIDS: Five bids were received September 11, 1946, ranging from the contract low of $555,464.00 to the high bid of $657,438.64.

LIST OF BIDDERS:

1. J. G. Bartholemew Co. (contract)	$555,464.00
2. T. C. Bateson Co.	559,395.00
3. Dolph Construction Co.	597,473.00
4. J. W. Bateson Co.	599,225.00
5. Noggard & Shaw and Vilbig Bros.	657,438.64

Item	Quantity	Unit Prices		
		(1)	(2)	(3)
1 Basin and flocculator no. 3	lump sum	$278,920.00	$252,765.00	$259,000.00
2 Mixing basin	lump sum	52,480.00	66,500.00	59,000.00
3 Cast iron water pipe—48"	1,405 lf	44.20	34.00	55.00
4 Cast iron water pipe—42"	775 lf	36.40	33.00	47.00
5 Cast iron water pipe—36"	120 lf	5.20	20.00	20.00
6 Cast iron water pipe—30"	170 lf	22.70	31.00	30.00
7 Cast iron water pipe—24"	50 lf	19.00	25.00	24.00
8 Cast iron fittings	70 ton	365.00	395.00	372.00
9 Wash water meter	lump sum	7,710.00	7,800.00	7,560.00
10 Raw water meters	lump sum	12,490.00	15,200.00	16,380.00
11 Sluice gates—48"	3 ea	1,650.00	2,300.00	1,794.00
12 Gate valves-54"	2 ea	5,125.00	6,350.00	5,076.00
13 Gate valves—48"	3 ea	4,915.00	4,800.00	4,823.00
14 Gate valves—42"	2 ea	3,650.00	4,400.00	3,575.00
15 Gate valves—36"	3 ea	120.00	725.00	300.00
16 Gate valves—30"	1 ea	70.00	275.00	250.00
17 Gate valves—24"	1 ea	800.00	700.00	785.00
18 Gate valves—18"	1 ea	530.00	450.00	520.00
19 Gate valves—12"	3 ea	230.00	300.00	220.00
20 Gate valves—8"	1 ea	130.00	200.00	125.00
21 Gate valves—6"	1 ea	120.00	125.00	115.00
22 Pipe vault	1 ea	6,000.00	6,500.00	8,000.00
23 Venturi meter box	1 ea	2,660.00	2,800.00	4,000.00
24 Overflow well	1 ea	3,550.00	2,300.00	2,000.00
25 Outlet structure	1 ea	420.00	230.00	250.00
26 Outlet well	1 ea	700.00	1,560.00	650.00
27 Valve vault—54"	1 ea	3,040.00	3,000.00	5,000.00
28 Alteration to no. 1 36" raw water line	1 ea	560.00	8,000.00	1,400.00
29 Alteration to no. 2 36" raw water line	1 ea	4,100.00	8,400.00	18,200.00
30 Connection to aerator	1 ea	630.00	2,700.00	1,960.00
31 Connection to mixing basin	1 ea	1,110.00	5,300.00	4,200.00
32 Water main—4"	1 ea	730.00	850.00	1,820.00
33 Lead lined coagulant line—4"	1 ea	2,840.00	2,400.00	2,912.00
34 Elictrical distribution system	1 ea	9,660.00	8,300.00	10,193.00
35 #1500 concrete	500 cy	13.25	14.50	12.00

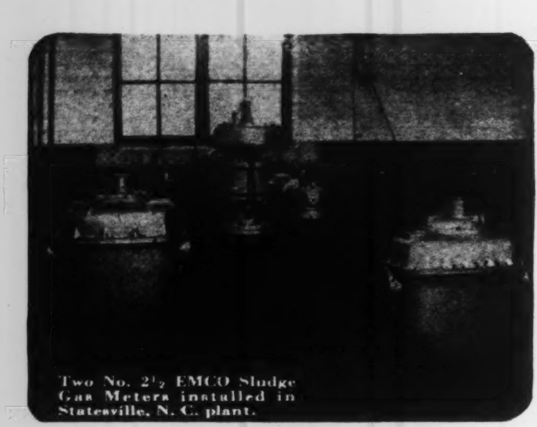
Merriman Dam, New York

OWNER: City of New York, N. Y., Board of Water Supply, Roger W. Armstrong, chief engineer.

PROJECT: Completion of Merriman Dam (Formerly Lackawack) of Delaware Aqueduct system and effluent chamber for the Rondout reservoir together with its superstructure, waste weir and waste channel and appurtenances.

CONDITIONS: Suitable earth for embankment is available nearby, owner is furnishing some material, equipment for aggregate production and for work at the effluent chamber, taken over from previous contractor. For the 1946 bidding, rolled embankment was separated into two types, Class A, for the core, subject to more exacting moisture control and rolling than Class B, the outer embankment. Time for completion, 45 consecutive calendar months compared to 52 for the 1945 bidding, and to 72 months for the original contract. Skilled wages for general construction on project range from $2.25 per hour for hoisting engineers to $1.25 for waterproofers and painters and $1.125 for sheet metal workers;

Continued on next page



Two No. 2½ EMCO Sludge Gas Meters installed in Statesville, N. C. plant.

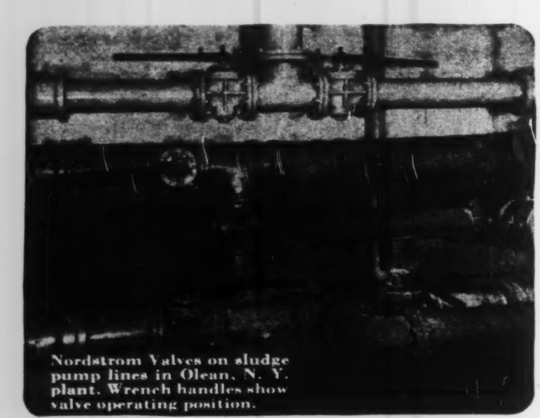
EMCO SLUDGE GAS METERS

Measure gas generated, gas consumed and gas wasted. Prove operating economies made possible by sludge gas utilization. Guide operators in the most efficient use of fuel at hand. Made in the positive bellows displacement type—all sizes.

One of four Pittsburgh-Eureka Hot Water Meters used in the Denver plant.

PITTSBURGH-EMPIRE WATER METERS

Measure heated water circulated through digestion tanks and cold water used throughout the treatment plant. Tell how much was used, when and where. Made in disc, piston, current and compound types for every class of service.



Nordstrom Valves on sludge pump lines in Olean, N. Y. plant. Wrench handles show valve operating position.

NORDSTROM LUBRICATED PLUG VALVES

Provide quick, quarter-turn control over the flow of air, gas, sludge, water and chemicals. Lubricated both for ease of operation and as a protection against corrosion and erosion. Non-sticking. Non-freezing. Compact. Wrench or gear operated. Sizes ½" through 30".

with this equipment

Everything's

UNDER CONTROL

In today's highly mechanized sewage treatment practice, meters are the eyes and ears—and valves are the hands—that operators need to intelligently run their plants. EMCO Sludge Gas Meters, Pittsburgh-Empire Water Meters and Nordstrom Lubricated Valves furnish treatment plant management with the necessary tools for efficient operating control. They are made in a complete range of sizes and types to suit every requirement.

Write for literature

PITTSBURGH EQUITABLE METER DIVISION
NORDSTROM VALVE DIVISION
Rockwell Manufacturing Company
Pittsburgh 8, Pa.

Sales Offices

Atlanta 3, Georgia
Bona Allen Bldg.

Boston 15, Mass.
708 Beacon Street

Chicago 3, Illinois
Peoples Gas Bldg.

Houston 2, Texas
2301 Commerce St.

Kansas City 6, Missouri
1805 Bryant Bldg.

Los Angeles 23, Calif.
3136 East 11th Street

New York 7, N. Y.
50 Church Street

Pittsburgh 19, Pa.
600 Grant Street

San Francisco 4, Calif.
582 Market Street

Seattle 99, Wash.
119 West Denny Way

Tulsa 1, Oklahoma
Sand Springs Road

Export: Rockwell International Corporation
Empire State Building, New York 1, N. Y.

Merriman Dam, New York

Continued from preceding page

semi-skilled from $1.65 for some machine operators to 75 cents for helpers and laborers, 70 cents for powder watchman.

RECORD OF BIDS: Three bids were opened February 26, 1946, ranging from $14,300,800 to $16,767,400. Contract was awarded to the low bidder, S. A. Healy. This low bid is an increase over the September, 1945 low bid of approximately 2.7 percent. The *Engineering News-Record* Construction Cost Index rose 3.3 percent in this same period.

LIST OF BIDDERS, Feb. 26, 1946:

1. S. A. Healy Co., White Plains, N. Y. and Chicago	$14,300,800
2. Johnson, Drake & Piper, Inc., Foley Bros., S. J. Groves & Sons Co., Jay L. McLaughlin	16,711,800
3. Del Balso Constr. Corp., and Rusciano & Son Corp., N. Y.	16,767,400

Five bids opened Sept. 11, 1945, ranging from $13,919,950 to $19,121,050, were rejected Sept. 18, 1945.

LOW BIDDERS, 1945:

I. S. A. Healy Co., White Plains, N. Y. and Chicago	$13,919,950
II. Del Balso Constr. Corp. and Rusciano & Son Corp., N. Y.	14,602,000
III. Johnson, Drake & Piper, Inc., Foley Bros., S. J. Groves & Sons Co., Jay L. McLaughlin	16,462,150

On the original contract, five bids were opened July 25, 1939, ranging from $15,486,150 to $22,134,000. Contract awarded Aug. 16, 1939.

LOW BIDDERS, 1939:

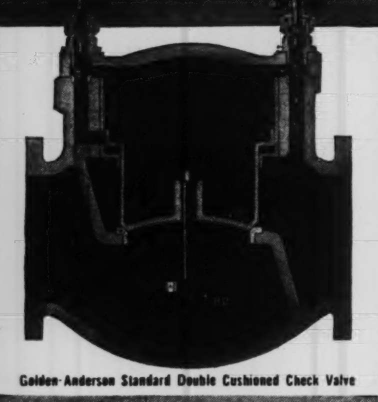
A. Mason & Hanger Co., Inc., New York (contract)	$15,486,150
B. Jahn-Bressi-Bevanda Constructors, Inc., Los Angeles, Calif.	16,195,700
C. Keystone Company, San Francisco, Calif.	16,720,150

Under the original contract a caisson cut-off wall, shaft, tunnel and a large quantity of rock excavation was completed and $7,425,000 paid.

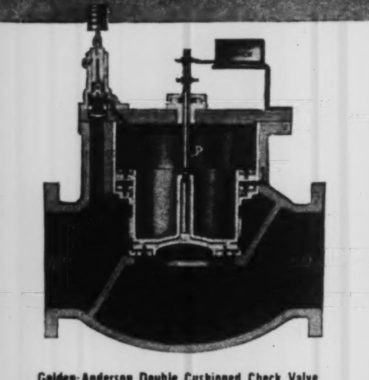
COMPARISON OF 1939, 1945 AND 1946, BIDS ON MERRIMAN DAM

			1946 Bids				1945 Low Bid Rejected			Comparable Items 1939 Contract†‡	
	Item	Quantity	No. 1		No. 2	No. 3	No. 1		Quantity	A	
1	Stream control	L. S.	$35,000.00	$35,000	$150,000.00	$100,000.00	$30,000.00	$20,000	L. S.	$20,000.00	$20,000
2	Borings	20,000 l. f.	6.25	125,000	4.70	6.00	8.00	160,000	30,000 l. f.	5.00	150,000
3	Removal of buildings	48,000 s. f.	.35	16,800	.15	.25	.20	9,600	40,000 s. f.	.20	8,000
4	Removal of soil	10,000 c. y.	.35	3,500	.50	1.00	.40	4,000	160,000 c. y.	.50	80,000
5	Earth excavation	400,000 c. y.	.95	380,000	.75	1.00	.75	300,000	1,220,000 c. y.	.35	427,000
6	Rock excavation	160,000 c. y.	3.00	480,000	5.00	5.00	4.00	640,000	410,000 c. y.	2.20	902,000
7	Prepare rock surfaces	4,000 s. y.	3.00	12,000	4.00	8.00	10.00	40,000	5,500 s. y.	8.00	44,000
8a.	Rolled embankment, Class A	1,500,000 c. y.	1.04	1,560,000	1.37	1.35	.93	5,208,000	5,600,000 c. y.	.48	2,688,000
8b.	Rolled embankment, Class B	4,100,000 c. y.	.94	3,854,000	1.13	1.26					
9	Refilling and embanking	520,000 c. y.	.45	234,000	.60	.50	.50	260,000	1,250,000 c. y.	.10	125,000
10	Rock embankment	750,000 c. y.	.60	450,000	.60	1.25	.55	412,500	1,000,000 c. y.	.45	450,000
11	Surface dress and grass	210,000 c. y.	1.50	315,000	1.50	2.00	2.00	420,000	170,000 c. y.	.60	102,000
12	Timber and lumber	120 M bm.	250.00	30,000	180.00	200.00	200.00	24,000	300 M bm.	135.00	40,500
13	Conc. masonry, open cut	70,000 c. y.	20.00	1,400,000	30.00	20.00	20.00	1,400,000	145,000 c. y.	14.00	2,030,000
14	Conc. masonry, tunnels	7,500 c. y.	25.00	187,500	40.00	30.00	39.00	292,500	48,000 c. y.	8.00	384,000
15	Dry rubble masonry, paving	55,000 c. y.	17.50	962,500	15.00	15.00	13.00	715,000	60,000 c. y.	3.50	210,000
16	Stone paving in mortar	12,000 c. y.	20.75	249,000	20.00	18.00	16.00	192,000	11,000 c. y.	5.40	59,400
17	Stone masonry in mortar	9,000 c. y.	23.00	207,000	22.50	20.00	22.00	198,000	27,000 c. y.	13.00	351,000
18	Stone facing in mortar	13,000 c. y.	45.00	585,000	40.00	40.00	33.00	429,000			
19	Furnishing granite facing, coping*	30 c. y.	175.00	5,250	150.00	200.00	300.00	9,000	3,500 c. y.*	100.00	350,000
20	Place granite facing, coping*	4,400 c. y.	85.00	374,000	80.00	80.00	100.00	440,000			
21	Brick facing masonry	420 c. y.	115.00	48,300	80.00	80.00	125.00	52,500	550 c. y.	36.00	19,800
22	Brick backing masonry	600 c. y.	60.00	36,000	50.00	60.00	60.00	36,000			
23	Concrete roof tiles	1,500 s. y.	37.50	56,250	20.00	20.00	30.00	45,000	1,450 s. y.	14.00	20,300
24	Granolithic finish	1,200 s. y.	4.75	5,700	3.00	2.00	2.00	2,400	850 s. y.	1.00	850
25	Protec. coating cem. mortar	1,000 c. y.	22.50	22,500	20.00	25.00	20.00	20,000	2,000 c. y.	25.00	50,000
26	Drill, holes, rock or masonry	7,000 l. f.	1.25	8,750	1.50	2.00	1.50	10,500	50,000 l. f.	1.00	50,000
27	Steel pipes for grouting	11,000 l. f.	1.00	11,000	1.00	1.00	1.50	16,500	30,000 l. f.	.80	24,000
28	Connections for grouting	600 ea.	3.00	1,800	4.00	5.00	4.00	2,400	4,000 ea.	3.00	12,000
29	Mix. and place. grout	5,000 c. y.	13.50	67,500	18.00	20.00	20.00	100,000	25,000 c. y.	14.00	350,000
30	Concrete pavement	700 c. y.	7.50	5,250	10.00	10.00	8.00	5,600	1,000 c. y.	6.50	6,500
31	Bit. macadam pavement	3,500 c. y.	3.50	12,250	6.00	7.00	7.00	24,500	3,300 c. y.	6.00	19,800
32	Bituminous material	47,000 gal.	.15	7,050	.15	.20	.15	7,050	55,000 gal.	.09	4,950
33	Granite curb	1,000 l. f.	7.00	7,000	5.00	7.00	8.00	8,000	1,300 l. f.	4.00	5,200
34	Portland cement	210,000 bbl.	3.75	787,500	3.00	3.00	4.00	840,000	570,000 bbl.	2.20	1,254,000
35	Cr. stone and gravel	4,000 c. y.	3.00	12,000	5.00	5.00	3.50	14,000	5,200 c. y.	3.00	15,600
36	Sand for filters, grout, etc	1,700 c. y.	3.00	5,100	3.00	5.00	4.00	6,800	6,000 c. y.	4.00	24,000
37	Vit. and asb.-cement pipes	28,000 l. f.a	1.00	28,000	1.65	1.50	2.00	54,000a	10,000 l. f.	1.50	15,000
38	Reinforced-concrete pipes	3,000 l. f.	5.00	15,000	5.00	5.00	6.00	18,000	....	....	....
39	Steel for reinforcing concrete	4,000,000 lb.	.08	320,000	.08	.08	.07	280,000	6,000,000 lb.	.055	330,000
40	Structural steel	1,100,000 lb.	.10	110,000	.08	.10	.08	88,000	1,850,000 lb.	.07	129,500
41	Steel interlining	1,170,000 lb.	.12	140,400	.12	.10	.09	105,300	1,130,000 lb.	.09	101,700
42	High-str. iron castings	37,000 lb.	.20	7,400	.25	.30	.20	7,400	285,000 lb.	.10	28,500
43	Cast-iron pipes and fittings	42,000 lb.	.15	6,300	.20	.20	.15	6,300	83,000 lb.	.10	8,300
44	Misc. c. i., w. i., steel	1,100,000 lb.	.30	330,000	.24	.25	.15	165,000	2,200,000 lb.	.12	264,000
45	Galvanizing	540,000 lb.	.07	37,800	.05	.05	.06	32,400	650,000 lb.	.03	19,500
46	Aluminum doors, sashes, frames	50,000 lb.	1.60	80,000	2.00	1.50	2.00	100,000	48,000 lb.	1.00	48,000
47	Alum. gratings, ladders, stairs, etc.**	52,000 lb.	1.15	59,800	1.25	1.50	1.00	52,000	135,000 lb.**	.20	27,000
48	Misc. bronze, copper, etc	48,000 lb.	1.00	48,000	1.00	1.00	1.00	48,000	75,000 lb.	.80	60,000
49	Inst. and test. equip. and metal furn. by city	2,900,000 lb.	.065	188,500	.10	.07	.07	203,000	2,000,000 lb.	.04	80,000
50	Painting	110,000 s. f.	.06	6,600	.05	.10	.07	7,700	250,000 s.	.03	7,500
51	Chlorination, per month	500 mo.	275.00	137,500	200.00	200.00	300.00	150,000	....	....	....
52	Liquid chlorine	600,000 lb.	.06	36,000	.05	.10	.08	48,000	50,000 lb	.10	5,000
53	Sanitary services	L. S.	130,000.00	130,000	400,000.00	200,000.00	125,000.00	125,000	L. S.	75,000.00	75,000
54	Passenger elevator	L. S.	25,000.00	25,000	26,000.00	50,000.00	25,000.00	25,000	....	....	....
55	Cleaning up	L. S.	35,000.00	35,000	100,000.00	25,000.00	30,000.00	30,000	L. S.	10,000.00	10,000

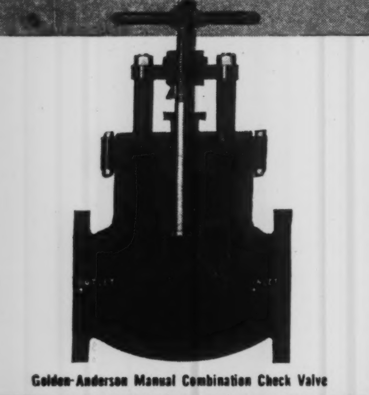
* Original contract specified sandstone or bluestone. ** Original contract specified wrought iron. † For complete tabulation see ENR June 20, 1940, p. 160. ‡ For 2nd and 3rd low bids see ENR September 27, 1945, p. 401. a 27,000 l. f. in 1945 Bids.



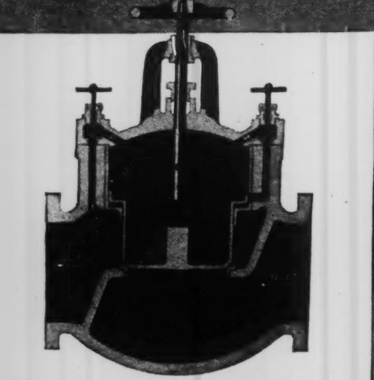
Golden-Anderson Standard Double Cushioned Check Valve



Golden-Anderson Double Cushioned Check Valve



Golden-Anderson Manual Combination Check Valve



Golden-Anderson Manual Double Cushioned Check Valve

THOUSANDS OF SAFE

"STOPS and STARTS"

day after day

hydraulic... automatic... manual

GOLDEN-ANDERSON

CUSHIONED

CHECK VALVES

Designed for safe, dependable control on the most difficult installation to eliminate serious surge and "Water Hammer"—to properly arrest reverse flow. GOLDEN-ANDERSON Cushioned Check Valves are specified on many of the most important new and replacement installations.

Write for informative technical catalog.

GA

GOLDEN-ANDERSON
VALVE Specialty Company
KEENAN BUILDING · PITTSBURGH 22, PA

Water and Sewer Extensions Roanoke Rapids, N. C.

OWNER: Roanoke Rapids Sanitary District, North Carolina, which includes the towns of Roanoke Rapids and Rosemary, together with some outlying territory in Halifax County, N. C. Consulting Engineer, William C. Olsen.

PROJECT: Extensions to existing water distribution system, consisting of 8 in. and 6 in. class 150 cast iron lines together with valves and hydrants, and extensions to sewer system, consisting of 8 in. sewer laterals with manholes and appurtenances.

CONDITIONS: Access to job site is by U. S. Highway 158, Atlantic Coast Line Railroad, or Seaboard Air Line Railroad. Gate valves will be furnished by the District. Material deliveries of sewer pipe are scheduled for March, 1947, and deliveries of water pipe, for eight months from bid opening. Contract time is 420 calendar days. Common labor wage rates approximate $.65 per hour.

BIDS: Three bids were received October 16, 1946, ranging from the contract low of $193,456.60 to $218,710.75.

LIST OF BIDDERS:

1. Blythe Bros., Charlotte, N. C. (contract)	$193,456.60
2. A. H. Guion & Co., Charlotte, N. C.	209,983.40
3. F. D. Cline, Raleigh, N. C.	218,710.75

			Unit Prices		
	Item	Quantity	(1)	(2)	(3)
	Section I				
1	8" cast iron pipe (cl. 150)	3,300 lf	$2.85	$3.00	$2.95
2	6" cast iron pipe (cl. 150)	26,858 lf	2.20	2.35	2.45
3	4" cast iron pipe (cl. 150)	19,490 lf	1.70	1.76	1.95
4	Cast iron specials	18,500 lb	.20	.20	.12
5	Installing 8" gate valves	4 ea	12.00	20.00	30.00
6	Installing 6" gate valves	32 ea	8.00	10.00	25.00
7	Installing 4" gate valves	65 ea	6.00	7.00	20.00
8	Fire hydrants	51 ea	105.00	125.00	150.00
	Section II				
1	8" vitrified clay pipe 0'–6' deep	15,784 lf	1.60	1.75	1.20
2	8" vitrified clay pipe 6'–8' deep	9,180 lf	1.75	1.85	1.60
3	8" vitrified clay pipe 8'–10' deep	3,255 lf	2.15	2.30	2.50
4	8" vitrified clay pipe 10'–12' deep	2,025 lf	2.50	2.75	4.00
5	8" vitrified clay pipe 12'–14' deep	557 lf	3.40	4.00	7.00
6	8" vitrified clay pipe 14'–16' deep	208 lf	4.60	5.00	10.00
7	8" vitrified clay pipe 16'–18' deep	31 lf	6.00	7.00	15.00
8	8" vitrified clay pipe 18'–20' deep	23 lf	8.20	10.00	25.00
9	8" vitrified clay pipe 20'–22' deep	10 lf	12.00	14.00	35.00
10	8" cast iron pipe 0'–6' deep	1,762 lf	3.00	3.00	2.85
11	8" x 4" wyes	1,200 ea	1.25	1.25	3.00
12	Manholes 0'–6' deep	87 ea	110.00	100.00	100.00
13	Manholes 6'–8' deep	20 ea	125.00	125.00	140.00
14	Manholes 8'–10' deep	7 ea	150.00	160.00	190.00
15	Manholes 10'–12' deep	5 ea	175.00	180.00	250.00
16	Manholes 12'–14' deep	1 ea	225.00	230.00	300.00
17	Manholes 14'–16' deep	1 ea	275.00	270.00	350.00
18	Manholes 16'–18' deep	1 ea	325.00	330.00	400.00
19	Connections to old manholes 0'–6' deep	18 ea	10.00	30.00	25.00
20	Drop manhole 10'–12' deep	1 ea	200.00	210.00	250.00
21	Drop manhole 12'–14' deep	1 ea	250.00	260.00	300.00
22	Drop manhole 14'–16' deep	1 ea	300.00	300.00	350.00
23	Drop manhole 16'–18' deep	1 ea	350.00	350.00	450.00
24	Convert manhole to drop 10'–12' deep	1 ea	50.00	60.00	50.00
25	Convert manhole to drop 12'–14' deep	1 ea	60.00	80.00	50.00
26	Convert manhole to drop 18'–20' deep	3 ea	80.00	100.00	75.00
27	Convert manhole to drop 20'–22' deep	1 ea	100.00	120.00	100.00
30	Rock excavation	50 cy	10.00	12.00	20.00

Water Lines, Stoneham, Mass.

OWNER: Metropolitan District Commission, Water Division, Massachusetts.

PROJECT: Furnishing and laying 3,680 ft. of 36 in. steel water pipe and 760 ft. of 36 in. cast-iron water pipe together with necessary appurtenances in Stoneham, Mass.

CONDITIONS: All valves, ironwork required for valve and manhole chambers, and wooden rings for insulation joints will be furnished by the District. District will also furnish and run joint compound for insulation joints and will furnish and set all air valves. Contract was awarded October 29, 1946 and is to be completed November 1, 1947. Wage rates are: crane operators, $2.025; trenching machine operators, $2.025; ironworkers, $1.85; bulldozer operators, $1.65; compressor operators, $1.65; and common laborers, $1.15.

BIDS: Ten bids were received October 24, 1946, ranging from the contract low of $135,870.00 to $260,665.00

LIST OF BIDDERS:

1. Edward M. Matz, Inc., Boston, Mass. (contract)	$135,870.00
2. Construction Units, Boston, Mass.	148,840.00
3. Wes Construction Co., West Roxbury, Mass.	159,630.00
4. N. Cibotti and S. Andreassi Co., Rosindale, Mass.	159,670.00
5. Rocco Zoppo, Roslindale, Mass.	162,720.00
6. Marinucci Bros. & Co., Dorchester, Mass.	176,115.00
7. Charles Struzziery, Roslindale, Mass.	187,125.00
8. John Williams, Dorchester, Mass.	187,570.00
9. Vincenzo Grande, Brighton, Mass.	194,560.00
10. S. Rotondi, & Sons, Stoneham, Mass.	260,665.00

			Unit Prices		
	Item	Quantity	(1)	(2)	(3)
1	Furnishing and laying 36" electric welded steel pipe	3,680 lf	$22.00	$25.00	$28.00
2	Furnishing and laying 36" cement lined cast-iron pipe	760 lf	22.00	24.00	25.00
3	Furnishing and laying 12", 8" and 6" cement lined c. i. pipe for by-pass, blow-offs and air vents	320 lf	10.00	5.25	8.00
4	Furnishing and laying 3½" fibre cable ducts	5.200 lf	2.00	1.40	1.00
5	Rock excavation above established grade	1,000 cy	10.00	10.00	12.00
6	Rock excavation below established grade	10 cy	20.00	20 00	12.00
7	Earth excavation below established grade	10 cy	5.00	6.00	4.00
8	Chambers for 36" gate and check valves	6 ea	200.00	475.00	600.00
9	Chambers for blow-off, by-pass and cable ducts	28 ea	150.00	155.00	150.00
10	Chambers for air valves and manholes	7 ea	100.00	120.00	200.00
11	Anchor piers for c. i. pipe in reservoir	60 ea	60.00	89.00	40.00
12	Concrete masonry for foundations and anchorages	100 cy	15.00	15.00	15.00
13	Bituminous macadam pavement	1,300 sy	2.00	3.00	3.00
14	Furnishing and placing gravel	200 cy	2.00	2 00	3.00
15	Furnishing and setting stone bounds	7 ea	20.00	30.00	10.00

Concrete Pipe Water Supply Line and Weir Houses, Provo, Utah

OWNER: City of Provo, Utah; Thomas H. Latimer, City Engineer.

PROJECT: Construction of concrete pipe water supply line and two weir houses at the mouth of Provo Canyon, Provo, Utah. Work involves the laying of 17,250 lin. ft. of 48" concrete pipe and 1,160 lin. ft. of 20" and 24" cast iron "blow off" pipe.

CONDITIONS: City of Provo will furnish f.o.b. Provo all gates, valves, recording instruments, cast iron pipe, and joint material for cast iron pipe. All materials must be hauled to job and installed by contractor. Costs may prove high due to necessity of right of way through pear, peach, and apple orchards. Contract time is 180 calendar days. Skilled labor wage rates range from $1.625 to $1.75; semi-skilled labor, from $1.15 to $1.25; and common labor, from $.875 to $1.00.

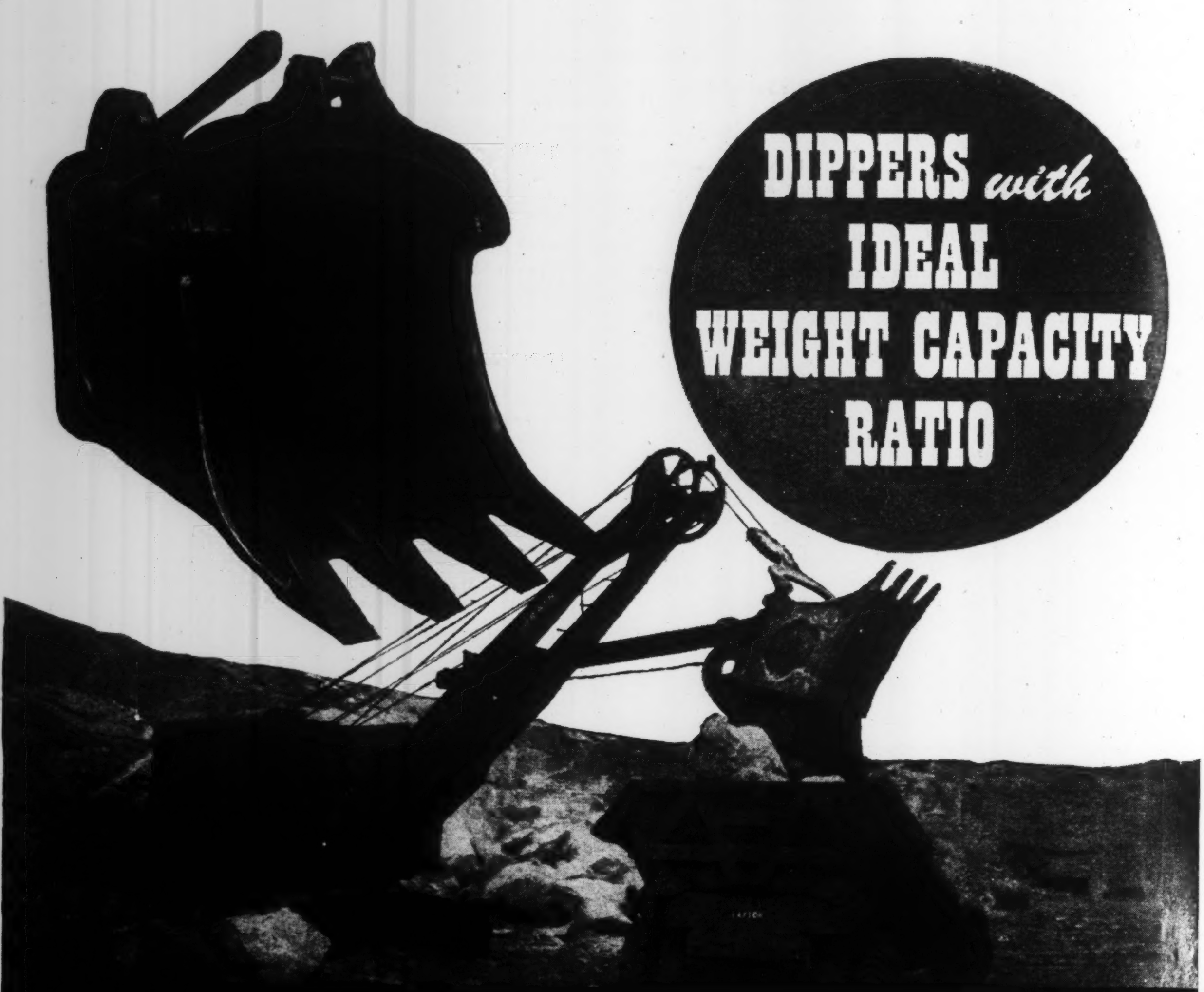
BIDS: Six bids were received November 26, 1946, ranging from the contract low of $301,842.08 to $452,123.30.

LIST OF BIDDERS:

1. Utah-Idaho Concrete Pipe Co., Salt Lake City, Utah (contract)	$301,842.08
2. Wheelright Construction Co., Ogden, Utah	310,089.15
3. Enoch Smith Sons Co., Salt Lake City, Utah	372,161.50
4. Neils Fugal, Pleasant Grove, Utah	377,635.85
5. Utah Construction Co., Salt Lake City, Utah	430,423.05
6. Stolte, Inc., Oakland 3, Calif.	452,123.30

			Unit Prices		
	Item	Quantity	(1)	(2)	(3)
1	Excavation for 48" pipe trenches	38,425 cy	$0.68	$0.56	$0.60
2	Excavation for 20" and 24" pipe trenches	795 cy	.345	.38	.60

Continued on next page



FOR BIGGER PAYLOADS — — AMSCO PLUG-WELDED DIPPERS

Amsco Plug-Welded Dipper Doing Tough Rock Digging Job at Lassiter Quarry of Bryan, Monroe Co., Raleigh, N. C.

LIGHTER WEIGHT

. . . bigger load with every bite

Plug-welding design makes possible a lighter weight dipper. Plugs in one casting fit in sockets in overlapping casting forming groove for weld deposit—gives strength with minimum use of welding material . . . permits interlocking design that reduces total weight . . . eliminates need for heavily reinforced sections.

Use all available shovel power to move a bigger load with every bite.

FASTER DIGGING

. . . greater yardage in every shift

Plug-welding eliminates jutting weld shoulders that resist penetration, loading, and dumping . . . contoured lip and easily-replaced teeth give clean bite for faster digging. Surface of manganese steel work-hardens under impact—takes on a "plowshare" polish that combats abrasion . . . offers minimum frictional resistance in loading and dumping. Flared body tapers out to door for faster unloading—material can't bridge.

GREATER STRENGTH

. . . no lost time for breakdowns

Plug-welding provides maximum strength as well as minimum weight.

Austenitic Manganese Steel is used throughout—further assurance of maximum durability and service life. Impact work-hardens the surface of "The Toughest Steel Known" to as high as 550 Brinell while body metal retains its basic toughness.

CAPACITIES ½ YARDS AND UP ------ *SEND FOR INFORMATION*

AMERICAN
Brake Shoe
COMPANY

AMERICAN MANGANESE STEEL DIVISION
CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., Oakland, Calif., Los Angeles, Calif., St. Louis, Mo.
Offices in principal cities. In Canada: Joliette Steel Limited, Joliette, Que.

Concrete Pipe Water Supply Line and Weir Houses, Provo Utah

Continued from preceding page

3 Excavation for structures (weir house not (included)	191 cy	2.50	2.00	2.00
4 Compacting backfill of 48" line	1,804 cy	2.44	1.75	2.00
5 Compacting backfill of 20" and 24" line	16 cy	2.44	2.00	2.00
6 Backfill 48" line	25,491 cy	.32	.11	.50
7 Backfill for 20" and 24" line	684 cy	.32	.11	.50
8 Furnishing and laying 48" concrete pipe	17,250 lf.	13.91	14.84	18.00
9. Laying and hauling of 20" and 24" cast iron "blow-off" line	1,160 lf	.95	.93	2.00
10 Construction of manholes, complete	4 ea	325.00	600.00	250.00
11 Construction of manhole with 4" pipe connection	1 ea	325.00	600.00	250.00
12 Construction of anchor and manhole	1 ea	1,670.00	925.00	500.00
13 Construction of "blow-off"	1 ea	1,200.00	425.00	750.00
14 Demolition and excavation for Gillespie weir house	lump sum	800.00	800.00	1,000.00
15 Demolition and excavation for Reservoir weir house	lump sum	800.00	800.00	1,500.00
16 Reinforced concrete foundation and weir structure for Gillespie weir house	lump sum	3,000.00	5,300.00	3,200.00
17 Reinforced concrete foundation and weir structure for Reservoir	lump sum	3,000.00	5,300.00	3,500.00
18 Super structure including sidewalks at Gillespie weir house	lump sum	4,500.00	4,100.00	3,500.00
19 Super structure including sidewalks at Reservoir weir house	lump sum	4,500.00	4,100.00	3,500.00

Storm Sewer Improvements Oklahoma City, Okla.

OWNER: City of Oklahoma, J. S. Waldrep, Consulting Engineer.

PROJECT: Improvements to existing storm sewers in south part of Oklahoma City. Work involves removal of sidewalk, pavement, trees, and old pipe, and laying of 38,950 lin. ft. of new sewer pipe.

CONDITIONS: The Oklahoma City Junction Railroad serves the city. All materials are to be furnished by the contractor. Contract time is 6 months. Skilled labor wage rates approximate $1.50 per hour, semi-skilled, $1.25, and common labor, $.90.

BIDS: Seven bids were received November 6, 1946, ranging from the contract low of $297,911.96 to $359,154.30. The low bid was 10 percent below the engineer's estimate of $330,536.90.

LIST OF BIDDERS:

1. Earl W. Baker & Co. (contract)	$297,911.96
2. Spicers Construction Co.	319,139.60
3. B. & M. Construction Co.	324,402.88
4. Koller Construction Co.	327,431.25
5. P. C. Sorenson & Co.	328,816.65
6. Osage Construction Co.	329,474.55
7. Sherman Machinery & Iron Works	359,154.30

Item	Quantity	Unit Prices		
		Engineer's Estimate	(1)	(2)
1 Sewer pipe—15"	300 lf	$2.25	$2.17	$2.25
2 Sewer pipe—18"	2,730 lf	2.50	2.57	2.50
3 Sewer pipe—21"	1,140 lf	3.00	2.79	3.00
4 Sewer pipe—24"	6,740 lf	4.30	3.75	4.05
5 Sewer pipe—27"	3,050 lf	5.25	4.41	4.60
6 Sewer pipe—30"	5,880 lf	6.00	5.36	5.26
7 Sewer pipe—33"	5,310 lf	6.75	6.22	5.63
8 Sewer pipe—36"	5,040 lf	7.70	6.72	7.00
9 Sewer pipe—42"	2,910 lf	10.50	8.61	9.50
10 Sewer pipe—48"	4,500 lf	12.50	10.89	12.50
11 Sewer pipe—54"	1,350 lf	15.00	11.88	13.50
12 Single grate inlets	13 ea	80.00	96.00	105.00
13 Double grate inlets	100 ea	120.00	148.00	170.00
14 Box type inlets	27 ea	70.00	77.00	70.00
15 Manholes, design No 1	84 ea	140.00	133.00	175.00
16 Manholes, design No. 3	33 ea	160.00	203.00	250.00
17 Junction box No. 1	1 ea	150.00	230.00	150.00
18 Pavement removed	3.090 sy	1.50	1.60	1.00
19 Driveway removed	1,360 sf	0.20	0.14	0.25
20 Sidewalk removed	350 sf	0.10	0.10	0.25
21 Concrete pavement—6"	880 sy	3.00	2.60	4.00
22 Asphalt pavement	2,040 sy	4.00	3.60	5.50
23 Concrete driveway—6"	1,360 sf	0.40	0.32	0.40
24 Concrete sidewalk—4"	350 sf	0.30	0.25	0.35
25 Single grate inlets removed	3 ea	15.00	18.00	15.00
26 Manhole removed	1 ea	30.00	50.00	50.00
27 Headwalls	3 ea	200.00	75.00	100.00
28 Corrugated pipe removed—42"	44 lf	3.00	2.09	4.00
29 Concrete pipe removed—15"	26 lf	1.20	1.00	1.25
30 Concrete pipe removed—21"	237 lf	1.60	1.40	1.50
31 Concrete pipe removed—30"	30 lf	2.20	1.60	3.00
32 Trees 6" & under removed	63 ea	15.00	8.00	5.00
33 Tree over 6" removed	24 ea	25.00	20.00	10.00
34 Fire hydrant reset	3 ea	60.00	67.00	25.00
35 Water meter reset	20 ea	10.00	15.00	5.00
36 Concrete curb	700 lf	0.75	0.80	0.75
37 Concrete curb & gutter	1,970 lf	1.25	1.30	1.25
38 Excavation	200 cy	2.00	0.90	0.50
39 Class A concrete	15 cy	30.00	32.00	25.00
40 Reinforcing steel	1,000 lb	0.10	0.09	0.10
41 Brick wall—8"	200 sf	2.00	1.20	1.25
42 Cast iron pipe—8"	16 lf	5.00	3.25	3.00
43 Inverted siphon	1 ea	1,500.00	1,800.00	750.00

Simms Bayou Sewage Treatment Plant, Houston, Texas

OWNER: Public Works Department, Houston, Texas. J. G. Turney, director-engineer; W. E. White, chief design engineer.

PROJECT: Simms Bayou Sewage Treatment Plant, (Activated Sludge Process) Construction Contract, No. 1, covering excavation, under drainage system, pipe, sluice gates and valves, connecting sewers primary and final settling tanks.

CONDITIONS: Owner furnishes equipment only. Contractor to complete job in 240 working days. Transportation facilities include concrete highway, water route and railway. Adjoining the site are rail and spur tracks. Uniformity of concrete sections in various structures designed to hold down cost. Specified wage rates include: skilled labor, $1.375 for commercial carpenters to $1.725 per hour for bricklayers; bricklayer's apprentice, from 57c. for 1st six months, to $1.29 for 8th six-months; apprentice cement finisher, 75c. for 1st year, to $1.25 for 4th year; common labor, 60c.

BIDS: Eight bids were received on March 13, 1946, ranging from the low of $705,412.90 to $1,031,830.

LIST OF BIDDERS:

1. Russ Mitchell, Inc., & Bishop Brick Co., Houston, Tex. (contract)	$705,412.90
2. J. W. Bateson, Dallas, Texas	720,264.00
3. R. F. Ball Constr. Co., Inc., Houston, Texas	795,290.04
4. R. P. Farnsworth & Co., Inc., Houston, Texas	839,030.82
5. Brown & Root, Inc., Houston, Texas	865,440.00
6. Thomas Bate & Sons, Houston, Texas	891,721.95
7. Tellepsen Constr. Co., Houston, Texas	975,156.85
8. Holland Constr. Co., Houston, Texas	1,031,830.00

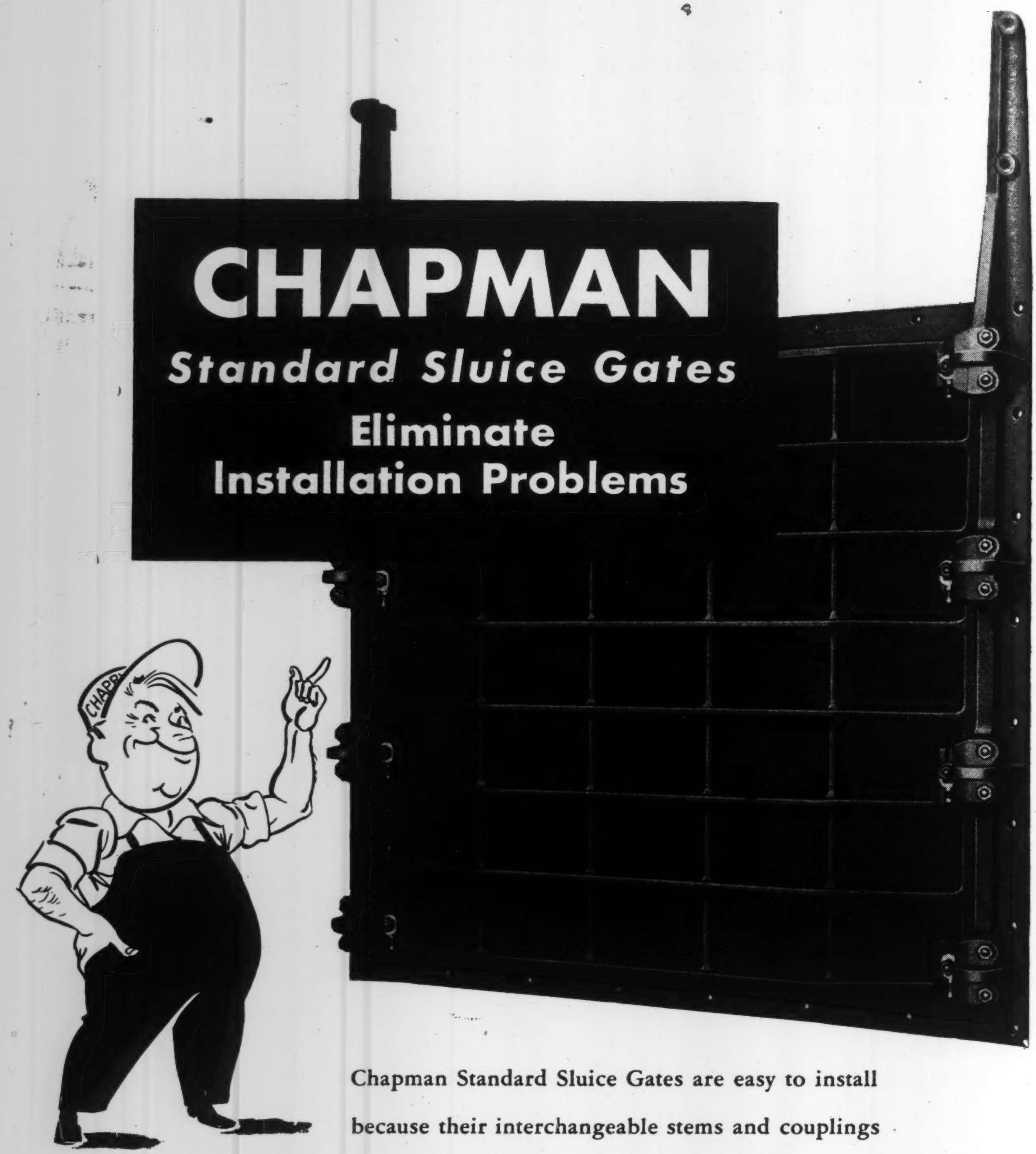
Item	Approx. Quan.	Unit Prices		
		(1)	(2)	(3)
GENERAL UNITS				
1. Clearing	6 acre	$200.00	$300.00	$331.40
2. Excavation with earth disposal in embankment on site				
1. Common excavation from above el. 18.5	24,100 cu. yd.	0.85	0.50	0.44
3. 2. Unclassified structural excavation below el. 18.5	69,500 cu. yd.	1.00	0.90	1.00
4. Roller (tamping) 2 drum	160 hr.	6.00	10.00	11.48
5. Roller (tamping) 4 drum	160 hr.	6.00	15.00	12.70
6. Excavation with earth disposal off-site by contractor				
Unclassified structural excavation, below el. 18.5	6,000 cu. yd.	1.05	0.80	0.29
7. Earth haul, disposal off-site as directed	12,000 yd. quar.	0.10	0.08	0.03
8. 8" open joint concrete sewer pipe under drains	2,920 ft.	0.62	1.00	0.56
UNDER DRAINAGE SYSTEM				
9. Compacted sand as of specs. in place	3,600 cu. yd.	4.00	5.00	4.17
10. 1" grout over under drains, in place as of specs	400 cu. yd.	30.00	14.00	23.84
11. Copper water-stops as of spec. in place, complete	600 lb.	1.25	0.60	1.20
13. Concrete in structures in place, complete, steel extra				

Continued on next page

CHAPMAN

Standard Sluice Gates

Eliminate Installation Problems



Chapman Standard Sluice Gates are easy to install because their interchangeable stems and couplings require no match-marking. They may be obtained with any type of operating control—manual, hydraulic cylinder or motor unit (completely enclosed in weatherproof housing, and delivered wired—ready for installation) Send for a copy of Chapman's Sluice Gate Handbook for complete information.

THE CHAPMAN VALVE MFG. CO.

INDIAN ORCHARD, MASSACHUSETTS

Simms Bayou Sewage Treatment Plant, Houston, Texas

Continued from preceding page

Concrete, Class "A"	10,939 cu. yd.	30.00	33.00	32.29
14. Concrete, Class "C"	100 cu. yd.	20.00	12.00	27.29
15. Concrete grout, settling tank floor as of plans and spec.	160 cu. yd.	25.00	15.00	47.38
16. Steel, concrete reinforcement, in place.	1,540,000 lbs.	0.068	0.07	0.103
17. Concrete admixture as of spec	60,000 lbs.	0.11	0.10	0.14
18. Timber left in foundns or in trenches.	15 Mfbm	160.00	100.00	159.25
CAST IRON PIPE IN PLACE, COMPLETE				
19. 6" pipe line	225 lin. ft	3.50	2.00	3.21
20. 8" pipe line	440 lin. ft.	4.50	2.50	4.31
21. 10" pipe line	660 lin. ft.	6.00	3.50	5.55
22. 12" pipe line	920 lin ft.	9.00	4.30	6.32
23. 14" pipe line	10 lin ft.	11.00	10.00	7.45
24. 20" pipe line	105 lin. ft.	14.00	8.00	15.50
25. 36" pipe line	60 lin. ft.	30.00	30.00	45.90
26. Trench excav. for Cast Iron pipe lines.	1,500 cu. yd.	1.00	1.50	3.77
CAST IRON PIPE FITTINGS				
27. In place, complete, as of specifications (a) Bell and spigot	43,800 lbs.	0.12	0.12	0.15
28. (b) Flange or flange & bell	13,200 lbs.	0.16	0.20	0.21
GALVANIZED STEEL PIPE				
29. Hand rail, complete in place as of specifications	162 ft.	4.00	5.00	4.03
30. Steel subway grating, in place	1,500 lbs.	0.50	0.50	0.48
SLUICE GATES AND DRAIN VALVES, IN PLACE COMPLETE (SEE PLANS FOR REFERENCE NUMBERS)				
31. Sluice gate—36"x36" gate ref. No. 1	1 each	918.00	900.00	598.23
32. Sluice gate—48"x48" gate ref. No. 2	3 each	1,050.00	1,000.00	786.60
33. Sluice gate—42"x36" gate ref. No. 3	6 each	950.00	900.00	696.36
34. Sluice gate—48"x48" gate ref. No. 4	11 each	1,530.00	1,400.00	785.48
35. Sluice gate—36" circular gate ref. No. 8	6 each	1,100.00	1,200.00	540.94
36. Sluice gate—36"x36" gate ref. No. 11	4 each	775.00	750.00	503.69
37. Sluice gate—20"x20" gate ref. No. 12	2 each	463.00	400.00	349.19
38. Slide gate 3'-3"x2'-9" gate ref. No. 14	18 each	60.00	60.00	61.65
39. Plug drain valve 12" dia. gate ref. No. 5 and 10	14 each	200.00	200.00	339.72
40. Flap valve 10" dia. gate ref. No. 6	6 each	50.00	60.00	138.45
41. Flap valve 12" dia. gate ref. No. 7, 9 and 13	4 each	60.00	70.00	157.45
42. Telescoping valve 12" dia. gate ref. No. 15	4 each	300.00	350.00	251.65
43. 4" pressure relief valve in place complete—ref. No. 16	60 each	9.00	10.00	21.39
44. 4" pressure relief valve in place complete—ref. No. 17	30 each	9.00	10.00	21.39
GATE VALVES INSTALLED IN CAST IRON LINES, COMPLETE				
45. Gate valve 12" dia. valve ref. CV. 1	2 each	200.00	200.00	408.83
46. Gate valve 12" dia. valve ref. GV. 2	1 each	220.00	225.00	396.35
47. Gate valve 12" dia. valve ref. CV. 3	4 each	230.00	228.00	377.34
48. Gate valve 12" dia. valve ref. GV. 4	2 each	230.00	230.00	377.91
49. Gate valve 6" dia. valve ref. GV. 5	2 each	150.00	100.00	251.93
50. Extra Riser Stem	5 lin. ft.	3.00	10.00	4.54
SEWER CONSTRUCTION QUANTITIES, IN PLACE COMPLETE				
51. Timber ordered left in trench	10 mfbm	160.00	200.00	179.93
52. Extra Brickmasonry	2 cu. yd.	10.00	50.00	27.57
53. Extra castings	20,000 lbs.	0.12	0.15	0.176
54. Standard manhole type A	1 each	125.00	200.00	109.12
55. Extra depth M. M. type A	2 ft.	20.00	30.00	14.07
56. 18" concrete sewer pipe load 0-6' deep	18 ft.	6.00	6.00	38.42
MONOLITHIC REINFORCED CONCRETE SEWERS				
57. 36" 0- 6' deep	140 ft.	12.00	11.00	21.49
58. 36" 6- 8' deep	280 ft.	14.50	12.00	24.02
59. 36" 8-10' deep	100 ft.	16.50	25.00	27.16
60. 42" 0- 6' deep	10 ft.	14.50	15.00	35.99
61. 42" 6- 8' deep	100 ft.	16.50	20.00	39.18
62. 48" 0- 6' deep	40 ft.	16.50	22.00	25.41
63. 48" 6- 8' deep	70 ft.	18.00	25.00	27.92
64. 48" 8-10' deep	60 ft.	25.00	30.00	30.44
65. 48" 10-12' deep	80 ft.	30.00	34.00	31.71
66. 48" 12-14' deep	50 ft.	40.00	37.00	34.23
67. 48" 14-16' deep	20 ft.	43.00	40.00	36.70
68. 60" 0- 6' deep	230 ft.	25.00	24.00	27.60
69. 60" 6- 8' deep	110 ft.	27.50	25.00	30.11
70. 60" 8-10' deep	50 ft.	30.00	30.00	31.36
71. 60" 10-12' deep	30 ft.	32.50	35.00	33.89
72. 60" 12-14' deep	80 ft.	42.50	38.00	36.41
73. 60" 14-16' deep	10 ft.	45.50	40.00	38.92
74. 18" corrugated iron pipe double dipped asphalt coated, in place	74 ft.	3.00	10.00	6.65
PRIMARY SETTLING TANKS				
75. Scum-Baffle, with anchor bolts complete in place as of plans	2 each	750.00	750.00	1,211.50
76. Steel notched weir with anchor bolts complete in place as of plans	2 each	600.00	600.00	1,238.33
77. Erection of Dorr mechanical equipment in place as of plans and specifications complete	2 each	800.00	1,500.00	2,056.62
FINAL SETTLING TANKS				
78. Steel notched weir with anchor bolts complete as of plans in place	4 each	750.00	600.00	1,377.59
79. 36"-10 Ga.-asphalt coated plain, pure iron galvanized or equal Influent pipe in place as of plans and specifications	100 ft.	15.00	11.00	11.26
80. Erection of Dorr mechanical equipment units in place as of plans and specifications complete	2 each	700.00	1,400.00	1,627.71
81. Steel plate complete final effluent weir	1 each	100.00	80.00	137.89
EXTRA WORK ITEMS				
82. Hauling, ton mile	200 ton mile	1.00	2.00	0.63
83. Extra work, common labor	1,000 man hr.	1.25	1.10	1.13
84. Skilled labor	400 man hr.	2.25	2.50	2.39
85. Engineer's office complete as of specifications	Lump Sum	1,000.00	2,000.00	1,077.46
86. Rolling-sand Under-drainage (compaction)	80 roller hr.	10.00	10.00	11.40
87. Sprinkling-sand under-drainage	1,000 M. gal.	1.25	3.00	0.89

Intercepting Sewer, Chicago, Illinois

OWNER: Sanitary District of Chicago, W. H. Trinkaus, Chief Engineer.

PROJECT: South side intercepting sewer in Cook County, Chicago, Ill. Work involves the laying of a sewer line, 18 ft. internal width, 17,000 lin. ft., and the laying of a line, 15 ft. internal width, 500 lin. ft. Rock will be encountered and must be excavated.

CONDITIONS: All materials are to be furnished by contractor. Contract time is 900 calendar days. Wage rates for skilled labor range from $1.675 to $2.25 per hour; for semi-skilled labor, from $1.35 to $1.675; and for common labor, are $1.30.

BIDS: Only two bids were received September 12, 1946, with the subsequent contract award for $9,492,450.

LIST OF BIDDERS:

1.	S. A. Healy Co., Chicago, Ill. (contract)	$9,492,450.00
2.	Peter Kiewit Sons Co. and Paschen Contractors, Inc. Chicago, Ill.	9,991,200.00

			Unit Prices	
	Item	Quantity	(1)	(2)
1	Sewer, 18' internal width	17,000 lf	$492.00	$519.00
2	Sewer, 15' internal width	500 lf	300.00	434.00
3	Standard manhole	1,200 lf	55.00	50.00
4	Offset manhole bases, type no. 1	19 ea	700.00	600.00
5	Offset manhole bases, type no. 2	3 ea	3,500.00	2,650.00
6	Offset manhole bases, type no. 3	2 ea	5,000.00	3,500.00
7	Offset manhole bases, type no. 4	7 ea	6,000.00	4,000.00
8	Concrete bulkheads	90 cy	80.00	75.00
9	Removal of concrete bulkheads	90 cy	45.00	50.00
10	Timber bulkheads	30 Mbm	225.00	200.00
11	Removal of timber bulkheads	30 Mbm	125.00	100.00
12	Reinforcement bars	5,500,000 lb	.08	.08
13	Iron castings and miscellaneous metals	33,000 lb	.30	.20
14	Rock excavation	31,000 cy	10.00	10.00
15	Additional earth excavation in tunnel	400 cy	6.00	6.00
16	Additional earth excavation in open cut	400 cy	2.00	2.00
17	Additional concrete, class A, in tunnel	400 cy	16.00	16.00
18	Additional concrete, class A, in open cut	400 cy	14.00	14.00
19	Additional concrete class B	400 cy	12.00	12.00
20	Field office	1 ea	35,000.00	40,000.00

Nut Island Sewage Treatment Plant, near Quincy, Mass.

OWNER: Metropolitan District Water Supply Commission (Massachusetts).

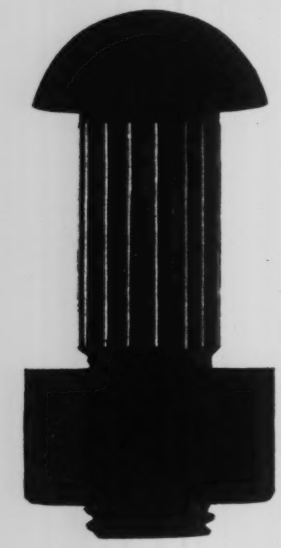
PROJECT: Construction of aeration and sedimentation tanks, influent and effluent conduits, main building foundations, grit storage tower foundations, grit channels, comminutor facilities, pump sump, foundations and settings, and appurtenant work. Total project involves 2,000,000 yards of reinforced concrete work.

CONDITIONS: The Metropolitan District Water Supply Commission will furnish 1,200,000 lb. of metal work and equipment which must be transported and installed by the contractor. Contract was awarded August 6, 1946 and is scheduled for completion October 31, 1947. Wage rates for crane, shovel, and drum machine operators are $2.025 per hour; for cement and asphalt finishers, stone masons, electricians, iron workers, plumbers, steamfitters, and sheet metal

Continued on next page

LITTLE THINGS

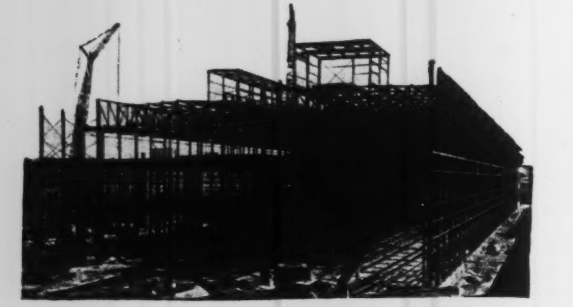
...that make Big Jobs Easier



STRUCTURAL RIB BOLTS with ANCO LOCK NUTS simplify construction jobs three ways: (1) They are so easy to use that one man with a maul and wrench takes the place of a forge and rivetting team, thus *labor saving.* (2) They are the *only* ribbed bolt on the market with American Standard threads and the "ANCO" lock nut, *offering exclusive safety advantages.* (3) They have unusual strength—tests show a ⅝" dia. bolt to be stronger than a ¾" dia. rivet.

Today STRUCTURAL RIB BOLTS are being used extensively on steel erection for buildings, bridges, tanks, towers, etc.—They are approved for Federal, State and Private projects. Can be furnished black or Galvanized.

We invite you to send direct to plant for complete engineering data—no obligation. We can ship immediately from stock—large or small orders.



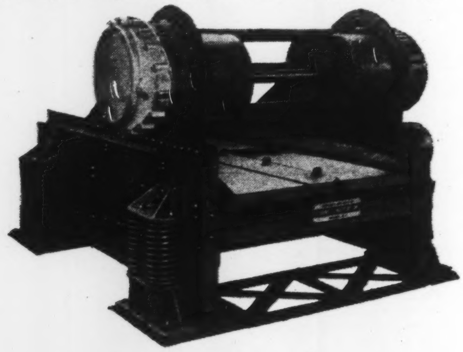
"ANCO" Automatic Lock Nuts are used by the millions, having been on the market since 1930 — accepted because they lock so securely! Neither shock or vibration will loosen them, but instead tends to tighten the locking!

Nut and lock are a single unit — no separate parts to be mislaid during installation. Locks so securely only a wrench can unlock it and can be used over and over.

Importantly, they comply with Federal Specifications FFB-571a. Price is comparable to the ordinary nut and lock washer, but far more secure and efficient.

Below is shown a ROBINS ELIPTEX SCREEN especially prepared for dewatering operations and equipped with *plenty* of ANCO nuts—rows of them. Robins has been using ANCO nuts for 15 years.

For sample nut and complete data, write us today.



We make shipments of large quantities direct from our Lebanon Plant—small quantities for quick deliveries from one of our many warehouses near you.

AUTOMATIC NUT COMPANY, INC.
LEBANON . . . PENNSYLVANIA

Nut Island Sewage Treatment Plant, near Quincy, Mass.

Continued from preceding page

workers, $1.725; composition roofers, $1.65; pile drivers, $1.60; carpenters and stone cutters, $1.50; and common labor, $1.15.

BIDS: Five bids were received July 31, 1946, ranging from the contract low of $1,179,763.20 to $2,108,441.15.

LIST OF BIDDERS:

1. V. Barletta Co., Roslindale, Mass. (contract)	$1,179,763.20
2. Henry N. Worthington & Co., Quincy, Mass.	1,309,077.98
3. Marinucci Brothers & Co., Dorchester, Mass.	1,360,546.60
4. Gahagan Const. Corp., Boston, Mass	1,459,468.50
5. M. De Matteo Const. Co., Quincy, Mass.	2,108,441.15

Item	Quantity	Unit Prices (1)	(2)	(3)
1 Excavation	40,000 cu. yd.	$1.50	$3.00	$1.80
2 Refill and embankment, unconsolidates	25,000 cu. yd.	.50	2.00	1.10
3 Refill and embankment, consolidated	3,000 cu. yd.	1.00	3.00	1.30
4 Crushed stone and screened gravel	2,000 cu. yd.	3.50	4.50	2.50
5 Gravel	500 cu. yd.	2.00	2.25	2.00
6 Conc. in sedim. and aeration tanks	10,000 cu. yd.	33.50	26.00	34.00
7 Conc. in influent and effluent conduits	4,300 cu. yd.	33.50	28.00	34.00
8 Conc. in grit channels and main building substructure	5,700 cu. yd.	33.50	26.00	39.00
9 Expansion and vibration joint filler	1,500 sq. ft.	.30	.30	1.00
10 Rubbed finish	18,000 sq. ft.	.15	.15	.20
11 Portland cement	32,000 bbl.	3.00	3.75	3.10
12 Reinforcing steel	2,500,000 lb.	.065	.08	.08
13 Light steel work	175,000 lb.	.30	.45	.28
14 Cast iron pipe and specials larger than 6 in	32,000 lb.	.15	.19	.17
15 Cast iron pipe and spec. 6 in. and under	15,000 lb.	.15	.18	.16
16 Miscellaneous ferrous metals	5,000 lb.	.60	.75	.52
17 Galvanizing	160,000 lb.	.05	.08	.09
18 Misc. non-ferrous metals	12,000 lb.	1.10	1.55	1.00
19 Miscellaneous lumber	15 M.ft.B.M.	300.00	230.00	200.00
20 Tile pipe, 8 in. and under	700 lin. ft.	5.00	1.50	2.00
21 Tile pipe, 10 in. to 15 in. (incl.)	500 lin. ft.	5.00	3.00	3.00
22 Precast reinf. concrete pipe	900 lin. ft.	5.00	4.00	5.00
23 Transporting, caring for and setting metal work and equip. furn. by the Commission	1,200,000 lb.	.03	.08	.08
24 Connections to existing high level sewer	lump sum	10,000.00	7,500.00	11,000.00
25 Electrical conduits	lump sum	8,000.00	8,077.00	9,000.00
26 Cleaning	lump sum	2,500.00	5,000.00	6,000.00
27 Furn. perform. bond	rate per $1,000	8.00	15.00	15.0

Sanitary Sewer Extensions, Hoisington, Kansas

OWNER: Hoisington, Kansas, Wilson & Co., Engineers, Salina, Kansas.

PROJECT: Sanitary sewer extensions, 8300 lin.ft. of 8 in. vitrified clay pipe, and concrete cylindrical pumping station, 14 ft. in diameter and 8 ft. high with 20 ft. pump pit of which ⅓ will be wet well and ⅔ dry pit.

CONDITIONS: There are no existing water and gas mains to obstruct sewer extensions. Dry earth excavation, no sand, rock, or water in trenching. Completion time, 100 days after receipt of material. Range of wages is $1.25 to $1.75 for skilled labor, $0.90 to $1.25 for semi-skilled labor, and $0.65 to $0.90 for common labor.

BIDS: Eight bids were received May 3, 1946, ranging from $22,766.80 to $36,543.30. The low bid is 6.2 percent below the engineers' estimate of $24,270.00.

LIST OF BIDDERS:

1. H. L. Matthews Const. Co., Dodge City, Kans	$22,766.80
2. L. F. Harper, Great Bend, Kans.	27,601.60
3. Mahan, McCarty, & Beese, Inc., Tulsa, Okla.	27,859.23
4. Burt & Binford, Contractors, Hutchinson, Kans.	29,564.20
5. P. P. Young Const. Co., St. Joseph, Mo.	30,844.31
6. Rhoades Const. Co., Newton, Kans.	32,876.38
7. Cement Asphalt Prod. Co., Winfield, Kan	34,862.30
8. Ammerman & Dace, Wichita, Kans.	36,543.30

Item	Quantity	Engineers' Estimate	Unit Prices (1)	(2)
1. Trench and backfill, 0′-6′	922 lin. ft.	0.30	0.35	0.25
2. Trench and backfill, 6′-8′	1,500 lin. ft.	0.40	0.50	0.25
3. Trench and backfill, 8′-10′	2,900 lin. ft.	0.50	0.60	0.30
4. Trench and backfill, 10′-12′	1,900 lin. ft.	0.70	0.80	0.34
5. Trench and backfill, 12′-14′	600 lin. ft.	0.90	1.00	0.36
6. Trench and backfill, 14′-16′	300 lin. ft.	1.30	1.20	0.38
7. Trench and backfill, 16′-18′	200 lin. ft.	2.00	1.50	0.40
8. 8-inch V. C. pipeline	8,019 lin. ft.	0.80	0.80	1.15
9. 8-inch C. I. pipeline	303 lin. ft.	2.80	3.30	3.75
10. 6-inch V. C. pipe risers	36 lin. ft.	0.50	0.50	2.00
11. 8″ x 6″ V. C. wyes	200 each	1.50	1.00	3.00
12. 6-inch V. C 1/8 bends	100 each	1.10	1.00	2.50
13. Std. manholes, 6 feet deep	21 each	100.00	80.00	125.00
14. Drop manholes, 6 feet deep	3 each	115.60	90.00	150.00
15. Extra manhole depth	88 lin. ft.	10.00	8.00	15.00
16. Remove and replace pavement	13 sq. yd.	5.00	4.00	5.00
17. Remove and replace bit. surface	110 sq. yd.	3.00	2.00	3.00
18. Pumping station, complete	1 Lump Sum	7,870.00	6,515.00	9,000.00

Outfall Sewer Line Extensions, Sacramento County, California

OWNER: Sacramento County, Sanitation District 1, E. A. Fairbairn, County Engineer; Harry N. Jenks, Consulting Sanitary Engineer.

PROJECT: Installation of 15″, 18″, and 24″ outfall sewer line extensions along Fruitridge Road from 45 Ave. to Power Line Road in Sacramento County.

CONDITIONS: The Sanitation District will furnish all pipe. Transportation is available by both rail and highway. Contract time is 100 calendar days. Minimum wage to be paid on job is $1.25.

BIDS: Only two bids were received December 23, 1946, the low bid of $58,526 and the high bid of $79,748.75.

LIST OF BIDDERS:

1. A. Teichert & Son, Inc., Sacramento, Calif. (contract)	$58,526.00
2. Steve P. Rados, Los Angeles, Calif.	79,748.75

Item	Quantity	Unit Prices (1)	(2)
1. Install 24″ vitrified clay sewer pipe complete in place	3,465 lf	$5.90	$6.50
2. Install 18″ vitrified clay sewer pipe complete in place	3,700 lf.	3.20	5.10
3. Install 15″ vitrified clay sewer pipe complete in place	5,825 lf	2.90	4.25
4. Construct standard manholes	34 ea	275.00	400.00

Airport Improvements Toledo Municipal Airport, Ohio

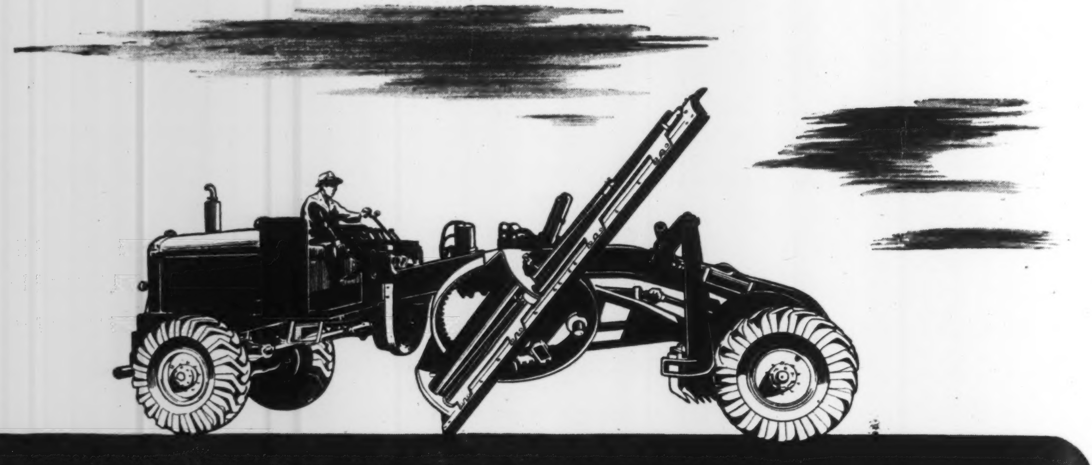
OWNER: City of Toledo, Ohio, Clayton L. Piper, City Engineer; Forster, Wernert, and Taylor Assoc. Engrs. and Arch.

PROJECT: Improvements to airport near Moline, Ohio, 6 miles east of Toledo. Work consists of a) construction of one and two-story brick and glass block airport terminal building, 270 ft. by 52 ft. b) moving east hangar, a concrete block structure, 400 ft. straight and then 150 straight in an "L" movement; moving power substation of brick and masonry construction, 300 ft. straight; and moving frame Grange building 600 ft. straight and then 200 ft. laterally across highway c) grading, paving, installing drainage, water, and sanitary sewerage system.

CONDITIONS: Specifications provided an option for bid proposals to be based on prices of labor and materials as of July 16, 1946. Where this option was selected, bidder submitted bid price for labor and material and net costs of materials and rate of wages which he expected to pay. In the event of an unanticipated increase in cost of materials or prevailing wages, the City of Toledo will pay the contractor the increased net cost. There is no specified contract time for the airport terminal building. Contract time for moving the three structures

Continued on next page

All-Wheel Drive and Steer • High Lift Blade • Extreme Reach • Completely Reversible Blade



there is No Substitute

FOR ALL-WHEEL DRIVE AND ALL-WHEEL STEER

in a motor grader . . . no way in which any rear drive, front steer machine can equal the maneuverability, power-at-the-blade and all-around performance of the 99-H Power Grader.

Get the complete story of the many additional features of the 99-H from your A-W distributor, or send for the latest bulletin.

AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U. S. A.

Austin Western

Airport Improvements, Toledo Municipal Airport, Ohio

Continued from preceding page

s 120 days. Grading, paving, drainage, etc., work was to be tarted August 1 and completed December 31, 1946. Contract, owever, was not awarded by August 1, 1946. Although rail acilities are 2 miles away, state highways go directly to the ob site. Prevailing wage rates per hour are: common labor, 1.125; sewer diggers above 6 ft., $1.41; glaziers, $1.50; ainters, $1.675; roofers, $1.725; carpenters, $1.75; steamtters, $1.875; plumbers, $1.875; plasterers, $1.975; masons, 2.00; electricians, $2.00; and sewer diggers below 6 ft. $2.25.

Airport Terminal Building

BIDS: Three lump sum bids were received July 16, 1946, ranging from the low bid of $308,130 to $322,000, with amounts uoted for sub-trades and unit prices bid for work to be added o or deleted from contract.

LIST OF BIDDERS:

1. Herman J. Suhrbier, Toledo, Ohio	$308,130
2. John Naumann & Sons, Inc., Toledo, Ohio	319,463
3. Comte Construction Co., Toledo, Ohio	322,000

Item	Unit Added	Unit Deleted	Unit Prices (1)	(2)	(3)
1. Plumbing-subtrade	.....	.....	$10,540	$11,067	$11,200
2. Heating and ventilating-subtrade	.....	.....	32,495	34,120	35,200
3. Lighting and power wiring-subtrade	.....	.....	12,333	12,950	13,200
4. Lighting fixtures-subtrade	.....	.....	8,830	9,272	9.500
5. Excavation below elevation 617.0	cu. yd.	.....	5.00	5.00	3.00
6. Excavation below elevation 617.0	.....	cu. yd.	1.00	3.50	2.00
7. Excavation to elevation 617.0	cu. yd.	.....	3.50	4.00	2.50
8. Excavation to elevation 617.0	.....	cu. yd.	1.00	3.00	2.00
9. Forms	sq. ft.	.....	.65	.46	.70
10. Forms	.....	sq. ft.	.25	.40	.60
11. Concrete	cu. yd.	.....	15.00	15.00	16.00
12. Concrete	.....	cy. yd.	9.00	10.00	14.50
13. Steel reinforcement (incl. setting)	lb.	.....	.10	.08	.08
14. Steel reinforcement (incl. setting)	.....	lb.	.04	.05	.07

Moving Three Structures

BIDS: Only one bid was received July 16 for this job. Bid in the amount of $90,685 from E. W. La Plante Co., Indianapolis, Ind. was itemized as follows:

Item	Amount
1. Moving east hangar, a concrete block bldg., 400 ft. straight and 150 ft. straight in an "L" movement (bldg. 80′ x 100′ x 30′)	$48,480
2. Moving power substation of brick and masonry construction, 300 ft. straight (3-story bldg. 22′ x 38′)	8,640
3. Moving frame Grange building 600 ft. straight and then 200 ft. laterally across highway (bldg. 102.7′ long, 52.7′ on south side, and 69.6′ on north side)	33,565

Grading, Paving, Drainage, Water and Sewerage System

BIDS: Only one bid, in the amount of $424,733.88, was received July 16 for this work. The bidder, Pierce Construction Co., Toledo, Ohio, chose the option of basing his bid on the cost of labor and materials.

	Item	Quantity	Unit Prices Labor	Materials
E-1	Grading, unclassified, incl. for drainage	29,770 cu. yd.	$1.00	......
T-71	Loading apron, 150 ft., 8″ cl. C reinf. concr	12,128 sq. yd.	1.60	$2.15
T-71	Taxiways, 50 ft., 8″ cl. C. reinf. concr	35,652 sq. yd.	1.35	2.15
T-71	Taxiways, 25 ft., 7″, 5″ cl. C. reinf. concr	5,104 sq. yd.	1.70	1.50
T-71	Entrance driveway, 36 ft., 8″ cl. C. reinf. concr	6,952 sq. yd.	1.75	2.15
I-13	Concr. walks, 6″ cl. C, in front of adminsitration bldg	16,695 sq. ft.	.33	.17
T-35	Asph. conc. wearing surf., 3″, on 20 ft. driveway	170 tons	2.00	4.00
T-35	Asph. concr. wearing surf., 2″, on auto parking strips	2,678 tons	2.00	4.00
B-20	Water bound macadam base, 5″, for 20 ft. driveway and auto parking strips	19,775 sq. yd.	.75	1.00
T-71	Hangar apron, 8″ cl. C reinf. concr	1,728 sq. yd.	1.75	2.15
I-12	Concr. curbs, 6″x16″ cl. C	188 lin. ft.	.75	.75
I-12	Chainlink wire fence incl. gates, 48″, and pipe posts set in concr	535 lin. ft.	.70	.90
I-2	Reinf. concr. sewer pipe, 15″	380 lin. ft.	1.34	1.50
I-2	Plain concr. sewer pipe, 15″	1,460 lin. ft.	1.59	.75
I-2	Reinf. concr. sewer pipe, 12″	2,150 lin. ft.	1.25	1.10
I-2	Plain concr. sewer pipe, 12″	1,842 lin. ft.	1.49	.45
I-2	Reinf. concr. sewer pipe, 10″	542 lin. ft.	1.23	.95
I-4	Downspout drainage vit. pipe, 8″	132 lin. ft.	1.39	.50
I-4	Downspout connections vit. pipe, 6″	182 lin. ft.	1.35	.40
I-8	Special double catch basins	5 each	85.00	90.00
I-8	Special catch basins	37 each	52.00	60.00
I-8	Special brick manholes, 63 lin. ft	9 each	65.00	60.00
I-8	Reset tops existing catch basins to new grade	5 each	20.00	......
I-3	Corr. metal perf. drain pipe, 6″	15,494 lin. ft.	.84	.75
I-3	Soft tile road driange, 6″	6,280 lin. ft.	.84	.75
I-9	Stone (#7) placed in backfill	790 tons	2.10	1.00
I-9	Stone (#46) backfill laterals french drains	3,970 tons	2.35	1.00
I-9	Install water system compl. with pump, tank, controls, fittings and piping (less deep well and casing)	1	7,000.00	8,000.00
I-9	Install sanitary sewer system compl	1	11,000.00	7,000.00
I-9	Ditch and backfilling for power cables, incl. plank and sand cushion	1,900 lin. ft.	.35	.15
I-9	Three conductor high voltage cables (7200 v.)	1,500 lin. ft.	.30	1.70
I-9	Single conductor low voltage cable (600 v.)	3,200 lin. ft.	.05	.15
I-9	150 KVA transformer compl. with gas absorber and std. accessories	1	137.50	2,455.55
I-9	15 KV potheads compl	5 each	27.00	75.00
I-9	2-pole contractor	1	11.00	24.83
I-9	Cl. C concr. apron light posts	10 each	55.00	20.00
I-9	Cl. C concr. telephone box support posts	5 each	55.00	20.00

Grading at Municipal Airport, Idlewild, New York

OWNER: City of New York, Department of Marine and Aviation; Downer, Green, and Carrillo, consulting engineers.

PROJECT: Work consists of general grading, construction of drains and cinder road, and planting beach grass at Municipal Airport at Idlewild. Site is located along Jamaica Bay in the southeasterly section of the Borough of Queens.

CONDITIONS: Since the present road to the construction area may be inadequate for trucking, additional access roads may have to be provided by the contractor. Contract time is 300 calendar days. Stipulated wage rates are power-driven shovel operating engineers, $2.50; metallic lathers, $2.10; electricians, $2.00; excavating laborers, $1.20; and common construction laborers, $.95.

BIDS: Seven bids were received August 29, 1946, ranging from the contract low of $695,874.50 to $1,382,920.00. The low bid is 40 percent below the engineer's estimate of $1,166,640.00.

LIST OF BIDDERS:

1. Davis Construction Co. (contract)	$695,874.50
2. Hendrickson Bros., Inc.	724,776.00
3. Gull-Defelice	897,623.50
4. Tully & Dinapoli	899,688.50
5. Tufano Contracting Corp.	980,981.75
6. Slattery Construction Co.	1,188,180.00
7. Delma Engrg. Corp. & Dilla Contracting Co.	1,382,920.00

	Item	Quantity	Unit Prices (1)	(2)	(3)
1	Earth excavation	1,350,000 cy	.375	.42	.54
3	Trench excavation	9,600 cy	1.00	1.25	1.00
4	Portland cement	325 bbl	3.00	3.00	2.50
4	1st class concrete (1:2:4)	200 cy	40.00	25.00	20.00
6	Bar reinforcement for structures	4,500 lb	.20	.08	.12
6	Miscellaneous metal	16,000 lb	.20	.20	.20
7a	Storm drain pipe—15″	700 lf	3.85	4.00	4.00
7b	Storm drain pipe—24″	200 lf	7.90	5.00	5.00
7c	Storm drain pipe—30″	650 lf	10.75	6.00	8.00
7d	Storm drain pipe—36″	730 lf	13.20	8.00	9.00
7e	Storm drain pipe—54″	1,800 lf	22.00	15.00	17.00
8	Cofferdams, pumping and draining	lump sum	20,000.00	15,850.00	24,000.00
9	Permanent sheeting and bracing	2 Mbm	200.00	200.00	250.00
10	Cinders—loose measure	2,000 cy	2.50	2.00	2.00
11	Timber and lumber—untreated	1 Mbm	200.00	200.00	300.00
12	Maintaining traffic	lump sum	3,850.00	3,500.00	10,000.00
13a	Leveling areas—area A	lump sum	1.00	1.00	1.00
13b	Leveling areas—area B	lump sum	9,000.00	12,750.00	10,000.00
13c	Leveling areas—area C	lump sum	6,000.00	10,500.00	10,000.00
13d	Leveling areas—area D	lump sum	3,000.00	4,500.00	5,000.00
14	Beach grass	250 ac	210.00	165.00	140.00
15	Sewer manholes adjusted	250 lf	18.00	10.00	20.00
16	Building demolitions	5 ea	400.00	50.00	100.00

Highway and Culvert, Adams Co., O.

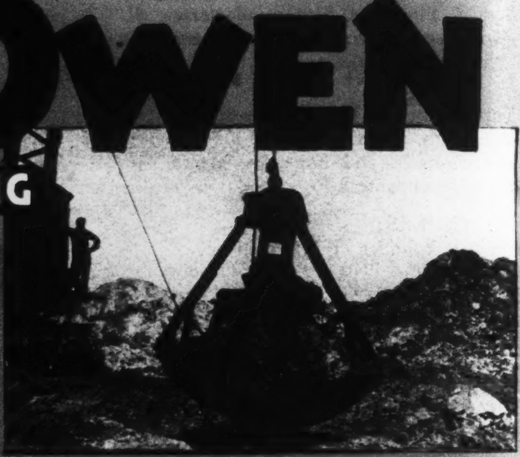
OWNER: State Highway Department, Columbus, Ohio.

PROJECT: Improving section A of State Highway 7, U. S. Highway 52. Work involves reinforced concrete paving of 4.124 miles, pavement to be 22 ft. in width and roadway 42 ft.

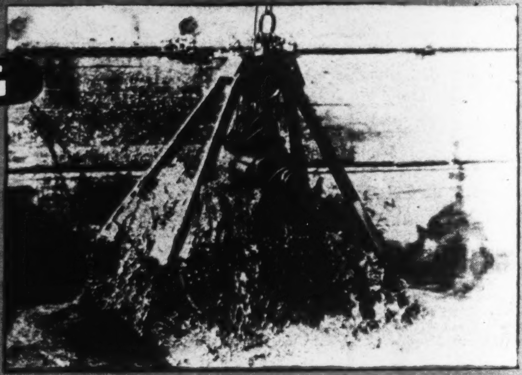
Continued on next page

Reduce COSTS with OWEN

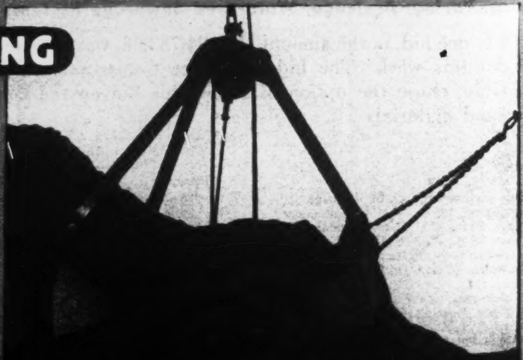
EXCAVATING



DREDGING



& REHANDLING



OWEN ROCK GRAPPLES are a "must" too for fast, efficient rock handling.

A MOUTHFUL AT EVERY BITE

BUCKETS

THE OWEN BUCKET CO.
6010 BREAKWATER AVE. CLEVELAND, O.
BRANCHES: NEW YORK, CHICAGO, PHILADELPHIA, BERKELEY, CAL.

Highway and Culvert, Adams Co., O.

Continued from preceding page

in width. A concrete arch culvert is to be constructed, the culvert to be 80.25 ft. in length, and the culvert span to be 25.54 ft.

CONDITIONS: All materials are to be furnished by the contractor. Contract completion date is November 30, 1947. Skilled labor wage rates range from $1.25 to $2.00 per hour; semi-skilled labor rates are $.90 to $1.425; and the common labor rate is $.65 per hour.

BIDS: Three bids were received November 19, 1946, ranging from the contract low of $616,126.65 to $753,699.15.

LIST OF BIDDERS:

1. Fuller-Davies Co., Cincinnati, Ohio (contract)	$616,126.65
2. W. H. Ringwald & Son, Chillicothe, Ohio	640,692.83
3. Charles H. Shook, Inc., Dayton, Ohio	753,699.15

	Item	Quantity	Unit Prices (1)	(2)	(3)
	Roadway				
E-1	Roadway excavation (unclassified)	178,759 cy	.57	.57	.90
E-3	Channel excavation	2,083 cy	1.50	1.75	1.19
E-4	Borrow (contractor to furnish)	2,072 cy	1.30	.57	1.34
E-109	Removal of trees and stumps	lump sum	6,290.00	2,850.00	4,100.69
E-11	Water	983,000 gal	.0045	.003	.0029
I-1	12" corrugated metal pipe for driveways	454 lf	2.71	1.86	2.30
I-1	15" corrugated metal pipe for driveways	48 lf	3.16	2.40	2.80
I-1	18" corrugated metal pipe for driveways	222 lf	3.59	2.52	2.64
I-1	21" corrugated metal pipe for driveways	102 lf	4.77	3.70	3.88
I-1	24" corrugated metal pipe for driveways	62 lf	5.56	4.21	5.33
I-1	30" corrugated metal pipe for driveways	170 lf	6.59	5.20	6.46
I-3	12" extra quality drain tile for roadway drainage	126 lf	2.00	1.25	1.30
I-3	18" vitrified sewer pipe for roadway drainage	34 lf	4.00	4.25	3.80
I-3	30" reinforced concrete pipe for roadway drainage	102 lf	6.70	7.30	6.22
I-4	6" extra quality drain tile for underdrains	28,448 lf	1.20	1.15	1.50
I-4	6" vitrified sewer pipe for underdrain outlets	828 lf	2.25	1.56	2.00
E-12	6" to 15" pipe removed and disposed of	51 lf	1.00	1.50	1.50
E-12	12" to 24" pipe removed and stored	799 lf	1.50	1.50	2.00
I-8	Standard No. 2-2A catch basin	1 ea	250.00	90.00	95.00
I-8	Standard No. 1-2A catch basin	1 ea	200.00	90.00	100.00
I-10	Type A riprap	1,229 sy	5.00	5.50	6.00
I-14	Stone paved gutter (Type A)	3,088.3 lf	2.55	5.50	4.50
I-14	Stone paved gutter (Type B)	38 lf	5.00	11.00	9.75
I-14	Concrete paved gutter	482.5 lf	3.10	2.00	2.50
I-15	Guard rail, steel beam type without brackets	8,550 lf	1.40	1.47	1.30
I-15	Guard rail removed and rebuilt, steel plate	92 lf	1.00	1.00	.85
I-15	Guard rail removed and stored, steel plate	60 lf	1.00	.75	.48
E-305	No. 1 seeding and protecting roadway areas	63,640 sy	.075	.085	.095
E-305	No. 2 seeding and protecting roadway areas	181,907 sy	.07	.075	.085
I-4	4" cast iron pipe American Waterworks Association Cl. A for spring drain without porous backfill	32 lf	6.00	2.50	3.50
I-4	2" wrought iron pipe, standard weight for spring drain without porous backfill	95 lf	3.00	1.20	2.15
I-10	Rock fill	262 cy	3.00	5.00	1.25
I-15	Flexible steel plate tension type guard rail full floating	144 lf	1.80	1.60	1.35
I-15	Guard rail removed and stored, wood plant	101 lf	.50	.75	.47
I-15	Guard rail removed and stored, cable	730 lf	.40	.75	.48
I-117	Side approaches, mail box turnouts and berm material	717 cy	3.50	5.45	4.25
SS-112	Classified embankment material	23,103 cy	1.18	1.55	1.80
L-9	Commercial fertiliser	23.72 ton	100.00	100.00	95.00
L-9	Agricultural ground limestone	118.61 ton	40.00	45.00	57.00
L-10	Sodding	18,033 sy	.60	.60	.95
L-12	Hall's Japanese honeysuckle vines	3,326 ea	.60	1.30	.95
L-14	American or White Ash 2" to 2½" cal. 30" B and B Trees	37 ea	60.00	20.00	24.00
L-18	Mulching	18,033 sy	.12	.04	.045
T-110	Traffic compacted surface course for temporary roadway	5,900 cy	2.25	4.75	4.25
M-10	Calcium chloride for temporary roadway	188 ton	40.00	35.00	30.00
	Pavement				
T-70	6" Portland cement concrete pavement	18.5 sy	3.60	3.00	9.00
T-71	9" reinforced Portland cement concrete pavement	52,973.6 sy	3.95	4.03	4.85
I-12	Type 4-A concrete curb	243 lf	2.00	.35	1.70
	Structures (20 Foot Span and Under)				
E-2	Excavation for structures (unclassified)	2,226 cy	3.00	3.00	1.987
S-1	Concrete for structures, Class C	822.9 cy	40.00	42.00	40.00
S-3	Waterproofing (Type B)	316 sy	2.00	2.50	1.20
S-4	Reinforcing steel	106,006 lb	.075	.07	.07
S-9	12" x 24" oz. folded copper strip	24.2 lf	3.00	2.50	3.76
S-24	Removal of existing structures	lump sum	3,000.00	1,000.00	767.00
S-27	12" vitrified sewer pipe for roadway culverts	88 lf	2.60	1.75	2.04
S-27	18" vitrified sewer pipe for roadway culverts	58 lf	4.00	3.50	3.74
S-27	24" vitrified sewer pipe for roadway culverts	141 lf	5.50	6.00	6.16
S-27	30" reinforced concrete pipe for roadway culverts	304 lf	7.00	6.00	5.90
S-27	36" reinforced concrete pipe for roadway culverts	145 lf	8.50	8.25	8.38
S-27	42" reinforced concrete pipe for roadway culverts	255 lf	10.00	10.25	10.05
S-27	48" reinforced concrete pipe for roadway culverts	256 lf	12.00	13.00	12.65
I-8	Standard No. 1-3 catch basins	1 ea	100.00	175.00	229.00
I-8	Standard No. 2-2A catch basin gratings (furnished and set)	2 ea	30.00	12.00	14.00
I-5	24" x 6" T pipe special for roadway culvert	1 ea	40.00	29.25	25.00
I-5	30" x 6" T pipe special for roadway culverts	4 ea	45.00	34.00	30.00
I-5	36" x 6" T pipe special for roadway culvert	1 ea	65.00	47.50	44.00
I-5	42" x 6" T pipe special for roadway culverts	4 ea	85.00	59.00	52.50
I-5	48" x 6" T pipe special for roadway culverts	2 ea	130.00	75.00	67.00
	Structure (Over 20 Foot Span)				
E-2	Excavation for structures, unclassified	417 cy	3.00	3.00	1.40
E-2	Excavation for structures, rock	261 cy	10.00	10.00	10.01
E-3	Channel excavation, unclassified	3,331 cy	1.50	1.75	1.55
E-3	Channel excavation, rock	692 cy	1.75	4.00	6.04
S-1	Class C concrete, barrel and wings	540 cy	50.00	49.00	40.00
S-1	Class E concrete, footings	181 cy	35.00	41.00	35.00
S-3	Type B waterproofing	94 sy	2.00	2.50	1.20
S-4	Reinforcing steel	28,413 lb	.08	.08	.07
S-24	Removal of existing superstructure	lump sum	400.00	500.00	300.00
I-10	Riprap	95 sy	5.00	5.00	6.00

Road Improvement, Pleasants Co., West Virginia

OWNER: West Virginia State Road Commission, Charleston, W. Va.

PROJECT: Construction of 4.816 miles of the St. Marys—Ritchie County line road; including clearing, grubbing, grading, draining and gravel surfacing.

BIDS: Eleven bids were received on February 19, 1946, ranging from the contract low of $357,974.00 to the high of $693,938.00.

LIST OF BIDDERS:

1. Boso & Ritchie, Inc., Ravenswood, W. Va. (contract)	$357,974.00
2. Keeley Const. Co., Clarksburg, W. Va.	466,971.00
3. Sutton Co., Oceana, W. Va.	481,125.00
4. Wilson & Son, St. Marys, W. Va.	499,972.50
5. A. S. Wikstrom, Bound Brook, N. J.	531,196.00
6. Coleman, Gay, Gregory & Poole, W. Va.	535,034.60
7. Vecellio & Grogan, Berkley, W. Va.	564,062.70
8. Western Const. Co., Nashville, Tenn.	578,991.29
9. Murphy Const. Co., Morgantown, W. Va.	598,936.70
10. Price Construction Co., Huntington, W. Va.	664,656.75
11. Smith Const. Co., Huntington, W. Va.	693,938.00

Item	Quantities	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	69 acres	$100.00	$100.00	$100.00
2. Unclassified excavation	544,000 cu. yds.	.44	.58	.65
3. Borrow	10,000 cu. yds.	.40	.45	.40
4. Overhaul	1,000,000 st. yds.	.01	.01	.005
5. Structure excavation	3,200 cu. yds.	2.50	3.00	2.50
6. Traffic bound gravel base	22,077 tons	2.00	3.00	2.50
7. Corr. metal pipe paved invt. 18"	1,100 lin. ft.	2.75	3.50	2.50
8. Corr. metal pipe paved invt. 24"	300 lin. ft.	4.00	6.50	4.25
9. 18" Conc. pipe-std. str	2,500 lin. ft.	3.00	3.00	3.80
10. 24" Conc. pipe-extra strg	108 lin. ft.	5.00	5.00	5.00
11. Class A concrete	585 cu. yds.	30.00	35.00	29.50
12. Class B concrete	140 cu. yds.	29.00	35.00	28.00
13. Reinforcing steel	151,000 lbs.	.06	.08	.09
14. 8" plain concrete pipe-perf	900 lin. ft.	1.25	1.25	1.00
15. Crushed stone for underdrain	300 cu. yds.	5.00	6.00	4.00

STEEL GOES UP F-A-S-T-E-R WITH A MICHIGAN MOBILE CRANE....

To "make time" on steel-setting jobs you need a crane that can ease cumbersome girders and structural sections into position with speed, accuracy and safety. . . MICHIGAN Mobile CRANES are outstanding for operating ease, stability for handling heavy loads with maximum safety, truck mobility, and many other profit-earning features . . . . Construction activity is due to greatly increase in the near future—have *you* modern, cost-cutting equipment which will enable you to ***profitably*** handle ***your*** share? It will pay you to seriously consider MICHIGAN Mobile CRANES and SHOVELS—available in 6 to 12 ton and 3/8 and 1/2 yard capacities, convertible to all standard attachments. . . .

MICHIGAN FINGERTIP AIR CONTROLS

Fast, smooth, positive. Simple, trouble-free, time-tested. Peak operating speeds easily maintained hour after hour—operator fatigue reduced to a minimum.

MICHIGAN

POWER SHOVEL COMPANY

BENTON HARBOR, MICHIGAN

Highway, Concrete, to Garrison Dam Site

OWNER: U. S. Engineers, Omaha District, Lt. Col. D. B. Freeman, District Engineer, Omaha, Nebr.

PROJECT: Concrete highway including grading and drainage, 13½ miles to Garrison Dam site.

CONDITIONS: All materials to be furnished by contractor. Rail transportation at one end, highway transportation at other end. Limited quantities of good quality aggregate in vicinity. Minimum wage rates specified: ironworkers, structural, $1.50; reinforcing, $1.44; carpenters, $1.25; operators: compressor, $1.00; cranes and shovels and draglines, $1.50; hoists, $1.40; motor graders, $1.40; pavers, $1.40; mixers, $1.00; pile drivemen, $1.25; rollers (to 8 tons), $1.20; (over 8 tons), $1.40; tractors, $1.30; trucks, 80c.; common labor, 70c.

BIDS: Six bids were received April 2, 1946, ranging from the low, $1,163,030.45; 3.8 percent below the Government estimate, $1,208,862.38, to a high bid of $1,801,308.17.

LIST OF BIDDERS:

1.	S. J. Groves & Sons, Co., Minneapolis, Minn. (contract)	$1,163,030.45
2.	W. H. Noel Co., Jamestown, N. Dak.	1,208,518.76
3.	Northwestern Engr. Co., Rapid City, S. Dak.	1,300,326.89
4.	Western Contracting Corp., Sioux City, Iowa	1,346,096.14
5.	Peter Kiewit Sons Co., Omaha, Nebr., and Morrison-Knudsen Co., Seattle, Wash.	1,424,346.13
6.	Okes Construction Co., St. Paul, Minn.	1,801,308.17

		Unit Prices		
Item	Quantity	(1)	(2)	(3)
1. Clearing and grubbing	41 acre	$150.00	$100.00	$150.00
2. Unclassified excavation	750,000 cu. yd.	.24	.19	19
3. Excav. of impervious overburden	60,000 cu. yd.	.22	.12	.20
4. Excav. of pervious material	572,480 cu. yd.	.45	.50	.51
5. Structural excavation	1,700 cu. yd.	1.00	1.00	1.50
6. Water for compaction	35,000 1,000 gal.	2.00	1.22	1.25
7. Rolling for addnl. compaction	500 roller hr.	4.00	4.50	5.00
8. Compacted gravel surfacing	34,610 cu. yd.	1.50	1.54	1.90
9. 18-in. reinf. concr. pipe	862 lin. ft.	2.25	2.51	3.00
10. 24-in. reinf. concr. pipe	1,254 lin. ft.	3.00	3.71	4.00
11. 30-in. reinf. concr. pipe	434 lin. ft.	4.50	5.34	5.25
12. 18-in. reinf. concr. flared ends	62 each	18.00	22.15	30.00
13. 24-in. reinf. concr. flared ends	54 each	25.00	31.40	38.00
14. 30-in. reinf. concr. flared ends	14 each	35.00	44.00	50.00
15. 24-in. corrug. met. culv. pipe	340 lin. ft.	3.25	3.67	3.40
16. 30-in. corrug. met. culv. pipe	120 lin. ft.	4.50	4.51	4.25
17. 36-in. corrug. met. culv. pipe	388 lin. ft.	5.00	5.41	5.25
18. 42-in. corrug. met. culv. pipe	92 lin ft.	7.00	6.41	6.00
19. 48-in. corrug. met. culv. pipe	324 lin. ft.	9.50	10.23	11.00
20. 54-in. corrug. met. culv. pipe	196 lin. ft.	10.00	17.88	17.00
21. 72-in. multiplate corrug. met. culv. pipe (10 gauge)	580 lin. ft.	20.00	22.17	23.00
22. 72-in. multiplate corrug. met. culv. pipe (12 gauge)	190 lin. ft.	17.00	17.38	20.00
23. Grouted stone gutter	43 cu. yd.	15.00	18.00	22.50
24. Reinf. concr. for ditch checks & concr. culv. headwall	20 cu. yd.	45.00	50.00	50.00
25. Guard posts	195 each	3.00	5.00	5.00
26. Snow fence	11,200 lin. ft.	.35	.25	.30
27. Steel snow fence posts	1,150 each	1.00	1.00	1.00
28. Removal of exist. fencing	1,900 rod	.50	.75	.50
29. Erection of new fence	1,284 rod	3.50	2.50	1.95
30. Erection of wooden gates	11 each	30.00	40.00	30.00
31. Install. permanent road signs	28 each	15.00	25.00	30.00
32. Referencing of alignment control points	55 each	10.00	8.00	15.00
33. R. R. traffic signals installed	1 set	2,500.00	3,500.00	1,500.00
34. Reinforced concrete pavement	168,127 sq. yd.	1.85	2.42	2.77
35. Cement	57,000 bbl.	3.10	3.09	3.30
36. Compacted gravel shoulders	127,710 sq. yd.	.30	.20	.15
37. Road maintenance	50 day	65.00	66.00	60.00

Surfacing, St. Helens Highway, Washington

OWNER: Public Roads Administration, District No. 1, Portland, Oregon, W. H. Lynch, Engineer.

PROJECT: Bituminous surfacing of 12.908 miles, 20 ft. pavement, 24 ft. shoulder to shoulder, St. Helens Highway, Columbia National Forest, Cowlitz-Skamania Counties, Washington.

CONDITIONS: Transportation by rail to Castle Rock and by highway from Castle Rock to job site. Crushed rock furnished by government. Contract time, 155 calendar days. Wage rates are $1.55 per hour for skilled labor, a range of $1.35 to $1.55 for semi-skilled labor, and $1.15 to $1.35 for common labor.

BIDS: Only two bids were received July 23, 1946 at Portland, Oregon, the low bid of $169,138.50 and the high of $174,081.50.

LIST OF BIDDERS:

1.	J. D. Shotwell, Tacoma, Wash. (contract)	$169,138.50
2.	Peter Kiewit Sons Co., Seattle, Wash.	174,081.50

			Unit Prices	
	Item	Quantity	(1)	(2)
2	Maintenance as authorized	all reqd.	$500.00	$500.00
3	Extra & misc. force account work	all reqd.	1,000.00	1,000.00
24(1)	Unclassified excavation	500 cu. yd.	1.00	.90
26(1)	Unclass. excavation for borrow, case 1	2,000 cu. yd.	1.00	.55
27(2)	Overhaul (1000′ free haul)	5,000 sta. yd.	.03	.02
28(2)	Special overhaul of borrow (1000′ free haul)	5,000 c. y. mi.	.20	.25
43(1)	Fine grading subgrade and shoulders	6,168 mi.	750.00	375.00
45(2)	Watering of subgrade	200 units	2.00	2.30
45(3)	Watering of base course	900 units	2.00	2.30
45(4)	Watering of surface course	400 units	2.00	2.30
45(5)	Providing and main. water plant or plants	all reqd.	500.00	450.00
45(6)	Watering of base course	200 units	2.00	2.30
46(1)	Pit-clearing	3 acres	200.00	500.00
46(2)	Pit-stripping	1,000 cu. yd.	.25	.25
2A(1)	Cr. gravel or cr. stone base crse., cl. (2), gr. (B–1)	18,000 cu. yd.	2.50	2.40
8(1)	Reconditioning of used roadbed	6,740 mi.	500.00	525.00
2(1)	Cr. gravel or cr. stone surf. crse., cl. (2), gr. (C)	9,000 cu. yd.	3.00	2.60
0(4)	M. C. cutback asphalt gr. (2) for prime coat	240 tons	42.50	40.00
4(1)	(Cl. A pavement) aggregate for designation (AT–126) surf. treat	9,200 cu. yd.	3.15	5.10
114(5)	R. C. cutback asphalt gr. (3), for class A surf. treat	205 tons	42.50	40.00
114(9)	Asphalt, gr. (150–200) for cl. A surf. treat	660 tons	47.50	40.00

Bituminous Concrete Road, Brewer, Maine

OWNER: State Highway Commission, Augusta, Maine, Lucius D. Barrow, Chief Engineer.

PROJECT: Removing old concrete pavement and bituminous patches, and laying new bituminous concrete road, 1.13 miles long at Brewer, Maine.

CONDITIONS: All materials to be furnished by contractor. Contract time is 125 calendar days. Stipulated minimum wages are $1.00 per hour for skilled labor, $.80 per hour for semi-skilled, and $.66 per hour for common labor. Heavy traffic on this street must be maintained during construction.

BIDS: Three bids were received July 17, 1946 at Brewer, Maine, ranging from the contract low of $154,991.75 to $165,318.00.

LIST OF BIDDERS:

1.	Bridge Construction Corp., Augusta, Me. (contract)	$154,991.75
2.	Lane Construction Corp., Meriden, Conn.	158,513.80
3.	Warren Bros. Roads Co., Cambridge, Mass.	165,318.00

		Unit Prices		
Item	Quantity	(1)	(2)	(3)
12a. Earth excavation	9,000 cu. yd.	$1.15	$1.50	$1.00
12b. Rock excavation	50 cu. yd.	5.00	8.00	15.00
12e. Trees removed	2 ea.	50.00	50.00	50.00
13. Excav. for structures	1,400 cu. yd.	3.25	4.00	2.25
24a. Gravel base course	6,600 cu. yd.	1.20	1.25	1.75
24b. Base outlets	50 cu. yd.	3.50	4.00	2.50
27. Bit. conc. base crse	182 tons	7.50	7.00	10.00
28a. Levelling mixture	1,621 tons	8.25	8.00	11.00
28b. Removal of bit. patches	600 sq. yd.	0.50	0.75	1.00
29. Cement concrete base	2,700 cu. yd.	15.00	16.00	16.00
30a. Stl. reinf. for conc. base	105,000 lb.	0.10	0.08	0.12
32. Gravel surface course	25 cu. yd.	2.50	4.00	4.00
35a. Bit. gr. surf. crse. (premixed method)	220 cu. yd.	6.00	5.00	5.00
35b. Bituminous material	3,600 gal.	0.25	0.20	0.20
37a. Bit. conc. surf. course	2,640 tons	10.75	10.50	11.00
37b. Tack coat	4,200 gal.	0.16	0.15	0.30
42a. Class "A" concrete	34 cu. yd.	40.00	40.00	30.00
42b. Class "B" concrete	58 cu. yd.	35.00	35.00	30.00
43. Stl. reinf. for conc. structures	5,000 lb.	0.10	0.10	0.10
48a. 8″ asph. coated corr. metal pipe	50 lin. ft.	1.50	1.40	1.10
48b. 10″ asph. coated corr. metal pipe	50 lin. ft.	1.60	1.70	1.25
48c. 12″ asph. coated corr. metal pipe	1,538 lin. ft.	2.00	1.85	1.75
48d. 15″ asph. coated corr. metal pipe	78 lin. ft.	2.50	2.25	2.00
50h. 48″ reinf. concrete pipe	112 lin. ft.	13.50	13.00	13.50

Continued on next page

Only ADNUN BLACK TOP PAVERS give you these Extra Job possibilities!

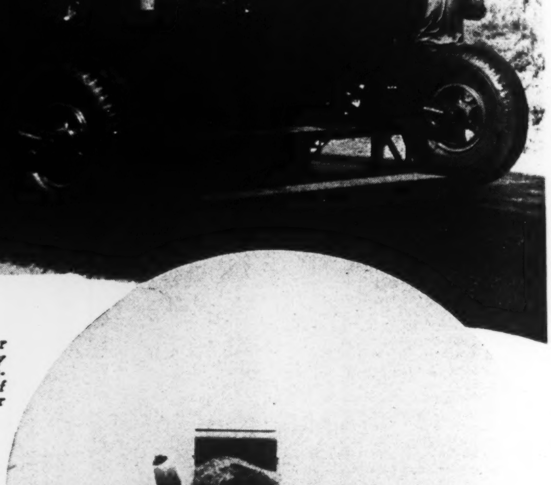
ABOVE—*Laying a four-inch course of No. 1 rock with an Adnun. Rock passes 4-inch screen, retained on 2-inch . . . An extra, profitable job for any Adnun!*

ABOVE—*Putting down base course for another smooth, Adnun-laid highway. Only Adnun has Continuous Course Correction feature for smoothing subgrade irregularities out of succeeding courses. Note retractable wheels for fast, easy between-jobs travel.*

ADNUN Black Top Paver ability goes far beyond precision laying of all types of black-top mixes at big volume rates. With an Adnun you can add extra job possibilities that mean more machine time on profitable work for you: Laying stone, slag or gravel courses . . . Laying soil cement and all types of built-up subgrade material.

In action, on any of these materials, Adnun hydraulic controls of all main paver functions, four-wheel-drive, power cutoff, and powerful six-cylinder engine make it easy for one man to get real paving results on a high output basis.

Adnun's rugged, cross-braced construction is made to take the pounding of heavy trucks for years of low-cost operation and maintenance. For the complete Adnun story, call your Adnun Representative, or write direct for illustrated Adnun Bulletin.



IN CIRCLE—*Laying a 10-inch course of subgrade aggregate to finished surface accuracy. A fast Adnun operation that makes finishing easier; completed roads smoother, longer-lasting.*

ADNUN
TRADE MARK REGISTERED
BLACK TOP PAVER

THE FOOTE CO., INC.
1922 State Street Nunda, New York

BUILDERS OF FOOTE KINETIC MIXERS, MULTIFOOTE CONCRETE PAVERS, AND ADNUN BLACK TOP PAVERS

Bituminous Concrete Road, Brewer, Maine

Continued from preceding page

51e: 15" vitrified clay pipe	50 lin. ft.	2.50	1.65	1.30
51f: 18" vitrified clay pipe	148 lin. ft.	3.50	2.00	1.50
52b. Drop inlet—Type B	1 ea.	125.00	175.00	125.00
52e. Catch basins—Type C	30 ea.	200.00	175.00	100.00
52g. Traps	15 ea.	40.00	25.00	25.00
55a. Underdrain—Type A	50 lin. ft.	2.00	1.75	3.00
55b. Underdrain—Type B	100 lin. ft.	3.00	2.50	3.00
55g. Underdrain outlets	40 lin. ft.	1.50	1.25	1.50
60. Metal sluice	24 lin. ft.	6.00	2.50	5.00
62a. Concrete curb	450 lin. ft.	2.80	2.00	2.50
62b. Integral concrete curb	9,360 lin. ft.	0.85	1.10	1.25
65d. Guard posts	12 ea.	3.00	4.00	1.50
76a. Relocating wire cable gd. rail	410 lin. ft.	0.60	0.50	1.50
76b. Relocating anchorages	4 ea.	12.00	12.00	15.00
77. Relaying 12"-15"-18" C. M. P. & 15" clay pipe	250 lin. ft.	1.50	1.00	1.50
78. Removing old concrete pavement	400 sq. yd.	1.25	1.00	2.50
67b. Loam borrow	450 cu. yd.	5.00	4.00	2.50
68. Sodding	1,750 sq. yd.	1.25	1.25	1.00
69. Project markers	2 ea.	25.00	25.00	20.00
72. Underdrain outlet marker	1 ea.	3.00	7.00	10.00
73. Traffic officers	650 man hrs.	1.25	1.25	1.00
75. Gravel overhaul	17,500 yd. mi.	0.10	0.10	0.10

Earth Road, Salt Lake Co., Utah

OWNER: State Road Commission, Salt Lake City, Utah; Roy W. McLeese, State Road Engineer.

PROJECT: Graded and drained earth road in Salt Lake County, extending from Mountain Dell to Big Mountain Summit. Roadway to be 26 ft. wide and 5.028 miles long.

CONDITIONS: Typical rolling mountain terrain will be encountered. Access to job site will be by highway only. Contract was awarded October 22, 1946 and is to be completed by June 30, 1947. Skilled wage rates range from $1.25 to $1.875 per hour; semi-skilled wages are $1.125 per hour; and common labor wages, $1.00 per hour.

BIDS: Three bids were received October 22, 1946; ranging from the contract low of $208,113.95 to $289,257.40. The low bid is 3.6 percent above the engineer's estimate of $200,963.95.

LIST OF BIDDERS:

1. W. W. Clyde & Co., Springville, Utah (contract)	$208,113.95
2. Floyd S. Whiting, Salt Lake City, Utah	234,812.50
3. Palfreyman Const. Co., Provo, Utah	289,257.40

Item	Quantity	Unit Prices Engineer's Estimate	(1)	(2)
1 Unclassified excavation	318,000 cy	.40	0.405	.56
2 Overhead, class A	440,000 st y	.02	.015	.015
3 Overhaul, class B	2,000 mi y	.20	.25	.25
4 Watering	2,700,000 gal	1.50	1.00	1.00
5 Rolling	2,400 hr	4 50	4.00	4.50
6 Surface ditches	20,000 lf	.07	.10	.05
7 Clearing and grubbing	60 ac	150.00	250.00	200.00
8 Concrete, class A	61 cy	40.00	45.00	40.00
9 Reinforcing steel	11,700 lb	.09	.10	.10
10 Excavation for structures	600 cy	1.10	1.50	2.00
11 Concrete pipe—18"	2,041 lf	3.00	3.50	3.50
12 Concrete pipe—24"	1,626 lf	4.00	4.50	4.00
13 Concrete pipe—36"	135 lf	7.50	8.40	8.00
14 Concrete pipe—60"	111 lf	17.00	20.00	20.00
15 Right of way fence, type B	5,000 lf	.20	.25	.25
16 Gates—14'	5 ea	25.00	25.00	25.00

Gravel Road, Norway and Waterford, Maine

OWNER: State Highway Commission, Augusta, Maine, Lucius D. Barrow, Chief Engineer.

PROJECT: Construction of a gravel road, 2.178 miles long, between Norway and Waterford, Maine.

CONDITIONS: All materials to be furnished by contractor. Contract time is 100 calendar days. Stipulated minimum wages are $1.00 per hour for skilled labor, $.80 per hour for semi-skilled trades, and $.66 per hour for common labor.

BIDS: Bids, taken July 17 at Augusta, Maine, ranged from the contract low of $48.325 to $58,095.60.

LIST OF BIDDERS:

1. W. E. Rogers, Gardiner, Maine (contract)	$48,325.00
2. P. E. Suci & Co., Pittsfield, Maine	50,620.00
3. W. Simpson Const. Co., Augusta, Maine	58,095.60

Item	Quantity	Unit Prices (1)	(2)	(3)
11. Clearing and grubbing	3.2acres	$250.00	$300.00	$500.00
12a. Earth excavation	21,300 cu. yd.	.60	.65	.70
12b. Rock excavation	500 cu. yd.	2.00	3.00	2.50
12e. Trees removed	15 ea.	20.00	25.00	20.00
13. Excavation for structures	320 cu. yd.	3.00	2.00	2.00
17a. Common borrow	1,000 cu. yd.	.50	.55	.60
24a. Gravel base course	14,000 cu. yd.	.75	.85	1.30
24b. Base outlets	100 cu. yd.	2.00	1.25	2.00
33a. Surface treated gravel course	1,950 cu. yd.	2.00	1.50	2.00
33b. Bituminous material	16,500 gal.	.19	.20	.16
42a. Class "A" concrete	22 cu. yd.	35.00	30.00	28.00
42b. Class "B" concrete	17 cu. yd.	32.00	30.00	26.00
43. Steel reinf. for con. structures	2,400 lb.	.10	.10	.10
47c. 12" corr. metal pipe	184 lin. ft.	1.50	1.50	1.50
47d. 15" corr. metal pipe	48 lin. ft.	1.75	1.75	2.00
47e. 18" corr. metal pipe	24 lin. ft.	2.25	2.00	2.50
48e. 18" asphalt coated metal pipe	310 lin. ft.	2.50	2.25	2.70
48g. 24" asphalt coated metal pipe	260 lin. ft.	3.50	3.50	4.00
48h. 30" asphalt coated metal pipe	144 lin. ft.	5.00	5.00	5.00
48i. 36" asphalt coated metal pipe	54 lin. ft.	7.00	6.00	6.40
53. Plain riprap	350 cu. yd.	5.00	5.00	3.50
55b. Underdrain—Type B	200 lin. ft.	2.00	2.50	3.00
55g. Underdrain outlets	100 lin. ft.	1.00	1.50	2.00
65a. Wire cable guard rail—Type "A"	1,200 lin. ft.	.90	1.10	.80
65c. Anchorages	14 ea.	15.00	25.00	15.00
65e. Anchorages (special)	4 ea.	20.00	30.00	30.00
76a. Relaying 12" corr. metal pipe	32 lin. ft.	.50	1.00	1.00
76b. Relaying 18" corr. metal pipe	26 lin. ft.	.50	1.50	1.00
67b. Loam borrow	100 cu. yd.	3.00	2.00	2.50
68. Sodding	100 sq. yd.	1.00	1.00	1.00
69. Project markers	2 ea.	10.00	20.00	15.00
70. Right of way monuments	30 ea.	10.00	10.00	10.00
75. Gravel overhaul	51,300 yd. mi.	.10	.10	.10

Bay Shore Freeway, San Mateo Co., California

OWNER: State Division of Highways, Sacramento, California; G. T. McCoy, State Highway Engineer.

PROJECT: Construction of Bay Shore Freeway from Colms Creek in South San Francisco to Broadway Ave. in Burlingame, San Mateo County. Project will provide a 6-lane divided highway, 5.1 miles long, with no grade crossings, but traffic interchange structures at San Bruno Ave., Mills Airport, Millbrae Ave., and Broadway Ave. Contract provides for construction of vertical sand drains and for a heavy layer of imported borrow material over the marshy tide flat portions. Asphalt concrete paving will be used on a crusher run base.

CONDITIONS: This project is one of the first units of the development of the old Bay Shore Highway between San Francisco and Palo Alto into a freeway. The work called for by the contract consists of the relocation of the route to the west of the existing Bay Shore Highway so that the city and county of San Francisco may expand the airport facilities at Mills Field.

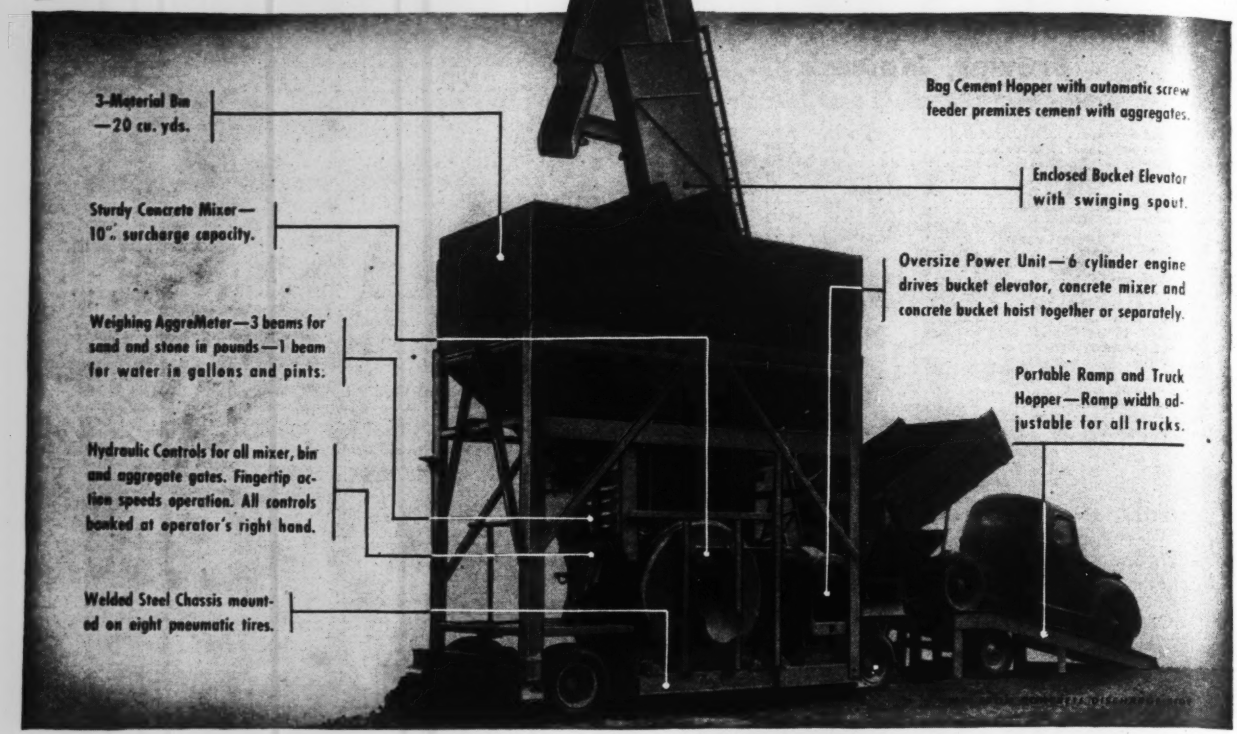
Contract is scheduled for completion November 10, 1947. Minimum skilled labor wage rates are $1.375 per hour, and minimum semi-skilled and common labor rates are $1.25 per hour.

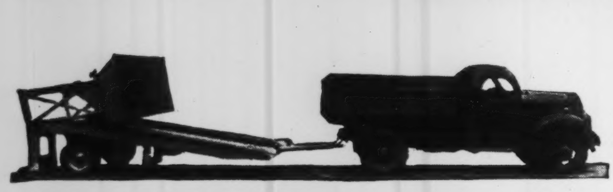
BIDS: Five bids were received September 18, 1946, ranging from the contract low of $2,998,138 to $4,656,694.

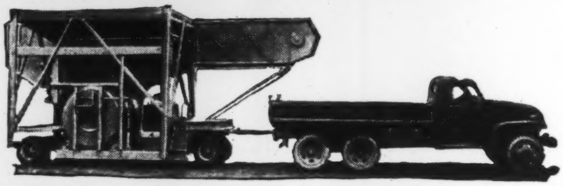
LIST OF BIDDERS:

1. Macco Const. Co., Oakland, Calif. and Morrison-Knudsen, San Francisco, Calif. (contract)	$2,993,138
2. Case American Const. Co., San Pedro, Calif.	3,291,005
3. Guy F. Atkinson Co., South San Francisco, Calif.	3,365,440
4. Charles L. Harney, San Francisco, Calif.	4,128,363
5. Eaton & Smith, San Francisco, Calif.	4,656,694

Continued on next page


3-Material Bin —20 cu. yds.
Sturdy Concrete Mixer—10% surcharge capacity.
Weighing AggreMeter—3 beams for sand and stone in pounds—1 beam for water in gallons and pints.
Hydraulic Controls for all mixer, bin and aggregate gates. Fingertip action speeds operation. All controls banked at operator's right hand.
Welded Steel Chassis mounted on eight pneumatic tires.
Bag Cement Hopper with automatic screw feeder premixes cement with aggregates.
Enclosed Bucket Elevator with swinging spout.
Oversize Power Unit—6 cylinder engine drives bucket elevator, concrete mixer and concrete bucket hoist together or separately.
Portable Ramp and Truck Hopper—Ramp width adjustable for all trucks.





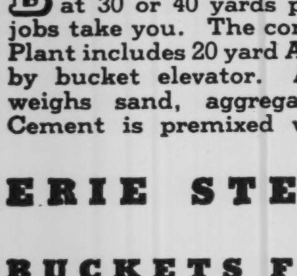
Portable Concrete Plant *Moves from Job to Job*

BE prepared to make specifications concrete at 30 or 40 yards per hour wherever your jobs take you. The complete Strayer Portable Plant includes 20 yard Aggregate storage loaded by bucket elevator. A 4—beam AggreMeter weighs sand, aggregates and water. Bag Cement is premixed with aggregates before entering Concrete Mixer. Finger-touch hydraulic controls of all operations are banked at operator's right hand. New features make this original plant easier and faster to operate and to make ready for setup or moving. Write for new booklet describing the 3/4 and 1 yd. plants and the new auxiliary concrete bucket hoist.

ERIE STEEL CONSTRUCTION COMPANY

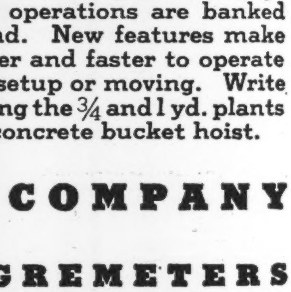
172 GEIST ROAD, ERIE, PA.

BUCKETS FOR THE JOB • ALSO AGGREMETERS



There's more payload less dead weight and greater strength in the new line of Erie Clamshells. The 2-rope Rehandler illustrated is available from stock in the correct size for your crane and job. Erie builds the most complete line of buckets offered by any manufacturer — Write for complete data on the bucket for your work.

ERIE GA PORTABLE AGGREMETER PLANTS standardized in 54- 78 or 102 Ton capacities use a specially designed 3-material weighing AggreMeter in 1, 1¼, 1½ and 2 cu. yard capacities. We are producing these plants in quantity and can make good delivery. Booklet GA-1 tells its story—Outline your requirements.



Bay Shore Freeway, San Mateo Co., California

Continued from preceding page

	Item	Quantity	Unit Prices (1)	(2)	(3)
1	Remove concrete	1,500 cy	$4.25	$4.00	$5.00
2	Clear and grub	lump sum	1,000.00	1,000.00	15,000.00
3	Roadway excavation	500,000 cy	.28	.50	.20
4	Structural excavation	19,000 cy	2.50	2.00	2.40
5	Ditch and channel excavation	3,000 cy	1.45	1.00	1.25
6	Overhaul	1,500,000 st y	.01	.006	.00[illegible]
7	Vertical holes sand drains	235,000 lf	.63	.60	.60
8	Sand backfill sand drains	33,000 ton	2.10	1.75	1.80
9	Fill material for sand drain blanket	44,000 ton	2.00	2.00	2.10
10	Cl. C and Cl. D subgrade	1,200 sy	.30	.15	.2[illegible]
11	Finish roadway	270 st	30.00	35.00	80.00
12	Crusher run base	148,000 ton	2.00	2.30	2.25
13	Asphalt emulsion paint binder and seal coat	120 ton	22.00	25.00	22.50
14	Screenings armor coat	4,100 ton	5.30	4.00	4.20
15	Liquid asphalt SC-6 armor coat	196 ton	21.00	25.00	22.00
16	Liquid asphalt SC-1 prime coat	78 ton	20.00	25.00	21.00
17	Asphalt concrete leveling course	40,000 ton	5.00	4.40	4.90
18	Asphalt concrete type A surface	24,000 ton	5.20	4.70	5.00
19	Asphalt concrete raised bars	60 lf	2.00	2.00	2.00
20	Cl. B portland cmt. concr. base and parking strip	210 cy	20.00	14.00	16.00
21	Redwood timber	1.4 Mbm	280.00	350.00	250.00
22	Cl. A portland cmt. concr. structs.	3,950 cy	34.00	50.00	50.00
23	Heavy stone riprap	1,300 cy	5.50	5.00	3.75
24	Cl. B portland cmt. concr. curbs and gutters	1,560 cy	30.00	25.00	32.00
25	Curb dowels	100 ea	.25	.25	.30
26	Cl. B portland cmt. concr. sidewalks	64 cy	29.00	25.00	35.00
27	Monuments	120 ea	5.50	5.00	5.00
28	Center line monuments	32 ea	48.00	20.00	22.50
29	Metal plate guard rail	7,500 lf	1.80	2.10	2.75
30	Culvert markers	280 ea	6.00	3.00	4.50
31	Guide posts	500 ea	6.00	3.50	4.00
32	Chain link fence	2,200 lf	1.90	1.75	1.80
33	New prop fence	10.5 mi	1,450.00	2,000.00	2,200.00
34	Reinforced concrete pipe—24 in.	630 lf	4.50	4.00	4.00
35	Reinforced concrete pipe—36 in.	380 lf	7.80	7.50	7.00
36	Reinforced concrete pipe—42 in.	180 lf	10.00	9.00	10.00
37	CMP 16 gauge—12 in	1,420 lf	1.80	1.75	2.00
38	CMP 16 gauge—18 in	4,100 lf	2.80	2.50	3.00
39	CMP 14 gauge—24 in	2,380 lf	4.10	4.00	4.00
40	CMP 12 gauge—36 in	1,700 lf	7.60	7.75	7.00
41	CMP 12 gauge—48 in	210 lf	11.00	13.50	12.00
42	Auto drainage gates—18 in	1 ea	60.00	50.00	60.00
43	Auto drainage gates—24 in	2 ea	90.00	70.00	75.00
44	Manholes	2 ea	300.00	150.00	150.00
45	Adjust manholes to grade	6 ea	170.00	50.00	90.00
46	Salvage exist. pipe culverts	100 lf	2.50	1.50	2.50
47	Furnish bar reinforcing steel	670,000 lb	.06	.05	.055
48	Place bar reinforcing steel	60,000 lb	.03	.03	.04
49	Miscellaneous iron and steel	4,000 lb	.55	.35	.35
50	Lighting standards	85 ea	300.00	375.00	400.00
51	Conduit—1½ in	12,000 lf	2.00	2.00	2.00
Alternate A:					
52	Hydraulic dredger fill	1,850,000 cy		.85	
53	Develop water supply and furnish water equip			2,000.00	
54	Apply water	4,000,000 gal		2.00	
Alternate B:					
55	Import borrow, type A	1,270,000 ton	.47		.535
56	Import borrow, type B	1,800,000 ton	.44		.535
57	Develop water supply and furnish water equip		15,500.00		15,000.00
58	Apply water	58,000,000 gal	.25		1.00

Highway Construction, Huntingdon Co., Pa.

OWNER: State Department of Highways, Harrisburg, Pennsylvania; T. C. Frame, Chief Engineer.

PROJECT: Construction of first section of U. S. 22 By-Pass at Huntingdon County, Pa. Work consists of highway construction and two substructures of a reinforced concrete bridge. Because of unavailability of steel, contract does not call for complete construction of bridge at this time.

CONDITIONS: Grading and drainage will vary from 49 ft. to 66 ft. in width. Approximately 907 lin. ft. of grading and drainage of railroad bed must be done. Native stone, type A, or crushed aggregate base course will be used with a bituminous surface course 20 ft. in width. Contract time is 140 days. Skilled labor rates are $1.10 per hour; semi-skilled, $.90 per hour; and common labor, $.70 per hour.

BIDS: Four bids were received October 18, 1946, ranging from the contract low of $510,138.09 to $759,982.78.

LIST OF BIDDERS:

	Bidder	Amount
1.	Mauger-Smith Inc., Columbus, Ohio (contract)	$510,138.09
2.	Central Pennsylvania Quarry, Stripping & Construction Co., Hazleton, Pa.	654,865.40
3.	S. J. Groves & Sons Co., Johnstown, Pa.	722,012.80
4.	B. Perini and Sons, Inc., Framington, Mass.	759,982.78

	Item	Quantity	Unit Prices (1)	(2)	(3)
1	Clearing and grubbing (state portion)	lump sum	$7,000.00	$10,000.00	$15,000.00
2	Class 1 excavation	339,917 cy	.62	1.06	1.10
3	Class 2 excavation	4,521 cy	3.00	6.25	4.00
5	Permanent barricade, type A	24 lf	20.00	6.00	4.00
6	Subgrade	5,829 cy	.30	.20	.30
8	Shoulders	2,385 lf	.30	.40	.40
13	Native stone, type A or crushed aggregate base crse. 8 in. in depth	5,829 sy	2.00	1.50	1.50
23	Plain cement concr. wearing surf. for bridge floors	412 sy	4.00	3.00	4.10
27	Bit. surf. crse. HC, HE, HSD or ID-2, 2½ in. in depth	5,638 sy	1.50	1.25	1.50
28	Class A concrete	617 cy	50.00	48.00	75.00
28a	Class AA concrete	9 cy	100.00	80.00	11.00
29	Class B concrete	1,796 cy	40.00	36.00	50.00
30	Plain steel bars	170,645 lb.	.07	.075	.12
32	Fabricated structural steel	3,805 lb	.20	.15	.16
35	Stone backfill for structures	180 cy	4.00	6.00	4.00
37	Concrete test piles (2 piles ea. 32 ft. long and 2 piles ea. 44 ft. long)	lump sum	1,900.00	3,000.00	3,000.00
38	Concrete piles—14 ft	28 lf	4.50	5.00	5.00
38a	Concrete piles—20 ft	40 lf	4.50	5.00	5.00
38b	Concrete piles—26 ft	130 lf	4.50	4.00	5.00
38c	Concrete piles—32 ft	352 lf	3.50	4.00	5.00
38d	Concrete piles—38 ft	532 lf	3.50	4.00	5.00
38e	Concrete piles—44 ft	616 lf	3.00	4.00	5.00
42	Cement rubble masonry	2,342 cy	38.00	36.00	30.00
52	Class B cement concr. paving for stream beds, 6-in. depth	4 cy	50.00	50.00	40.00
53	Grouted rubble paving for stream beds	3 cy	20.00	50.00	35.00
54a	Type F-2 endwall including rails	1 ea	200.00	150.00	400.00
55	Manhole	1 ea	400.00	250.00	250.00
56	Type D inlet	1 ea	200.00	125.00	250.00
56a	Type E inlet	5 ea	200.00	115.00	250.00
56b	Type E inlets with sumps	6 ea	300.00	150.00	225.00
56c	Type H inlets	12 ea	300.00	200.00	275.00
56e	Type G inlet	1 ea	200.00	150.00	350.00
56f	Inlet—4 ft	1 ea	300.00	200.00	410.00
57	Rebuilt manholes	2 vf	40.00	30.00	25.00
60	Cast-iron pipe, 18 in., interlocking style	42 lf	3.00	7.00	8.90
61	Corrugated metal pipe—15 in.	160 lf.	3.50	2.70	4.20
61a	Corrugated metal pipe—18 in.	20 lf	4.00	3.25	4.50
65	Reinforced cement concrete pipe—15 in	690 lf	4.50	3.50	4.80
65a	Reinforced cement concrete pipe—18 in	2,562 lf	5.00	4.00	8.00
65b	Reinforced cement concrete pipe—24 in	394 lf	6.50	6.00	7.20
65c	Reinforced cement concrete pipe—30 in	242 lf	10.00	9.00	10.50
65g	Extra strength reinforced cement concr. pipe—24 in.	128lf	7.00	6.00	7.80
66	Plain cement concr. or vit. clay pipe —15 in	452 lf	3.50	3.00	3.40
66a	Plain cement concr. or vit. clay pipe —18 in	120lf	4.00	4.00	4.10
66b	Plain cement concr. or vit. clay pipe —24 in	26 lf	4.25	6.00	8.90
67a	Terra cotta pipe, 15 in., relaid	234 lf	2.50	3.00	2.70
69	Tile underdrain—4 in	2,108 lf	1.40	1.30	2.15
69a	Tile underdrain—6 in	1,090 lf	1.50	1.50	2.30
71	Tile outlets—4 in	110 lf	1.00	1.00	2.30
71a	Tile outlets—6 in	30 lf	1.25	1.10	2.45
72	Treated timber cribbing	4.2 Mbm	300.00	275.00	500.00
74	Coarse aggregate for extra depth tile underdrain	5 cy	5.00	7.00	5.40
75	Subgrade drains	1,400 lf	.70	.70	.80
78	Plain cement concrete gutter, type C	2sy	10.00	5.00	5.40

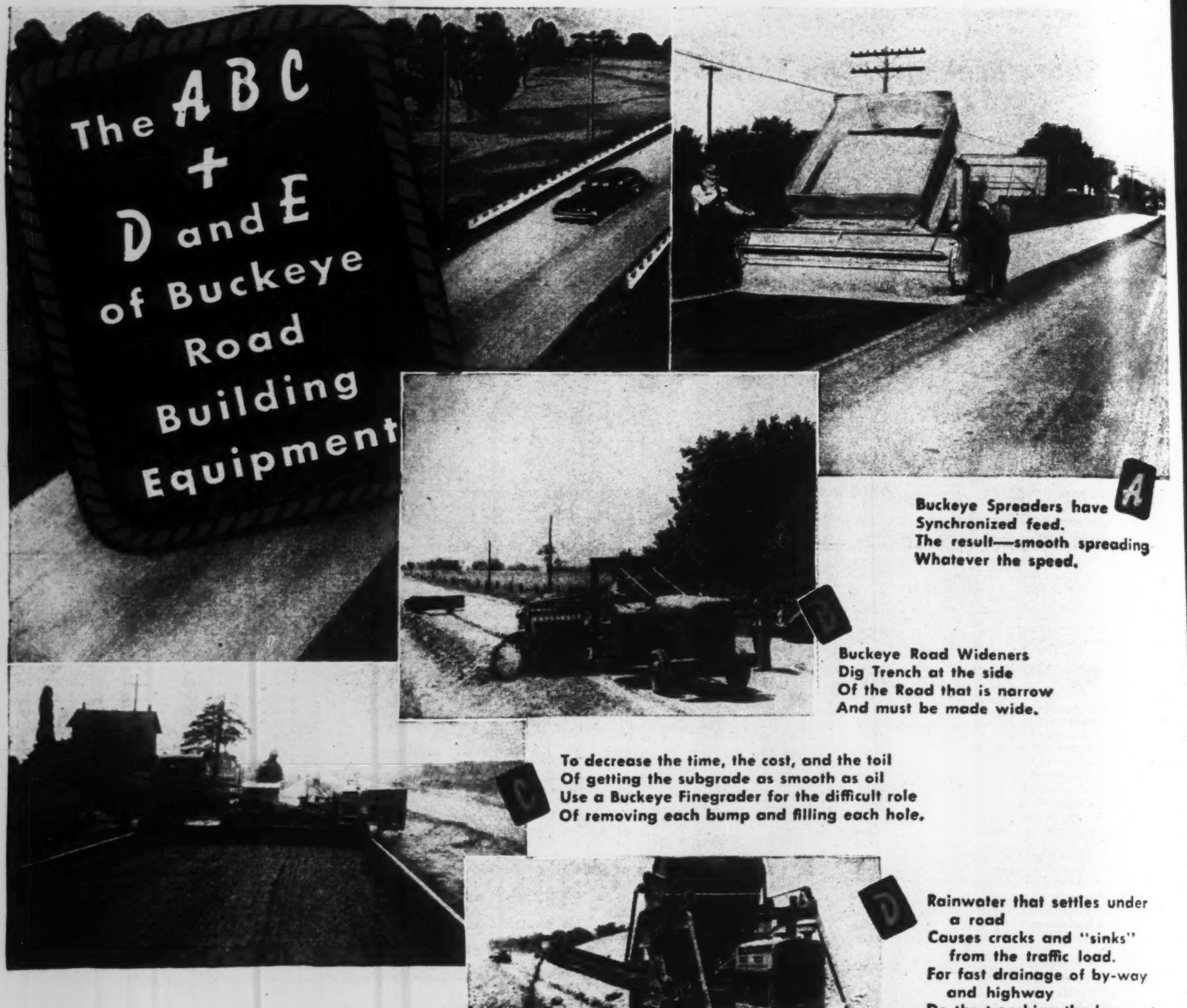
Street Improvement, Oklahoma City, Oklahoma

OWNER: Oklahoma City, Oklahoma; V. G. Thompson, Engineer.

PROJECT: Grading and paving 14 residential blocks in Oklahoma City, Oklahoma, with 5-in. asphaltic concrete on a stabilized sand base. Both the curb and gutter to be concrete.

CONDITIONS: Access to job site is available by both railroad and highway. All materials to be furnished by contractor. Contract time is 80 working days. Skilled labor wage rates are $1.50 per hour; semi-skilled, $1.25; and common labor, $.95 per hour.

Continued on next page



Buckeye Spreaders have
Synchronized feed.
The result—smooth spreading
Whatever the speed.

Buckeye Road Wideners
Dig Trench at the side
Of the Road that is narrow
And must be made wide.

To decrease the time, the cost, and the toil
Of getting the subgrade as smooth as oil
Use a Buckeye Finegrader for the difficult role
Of removing each bump and filling each hole.

Rainwater that settles under
a road
Causes cracks and "sinks"
from the traffic load.
For fast drainage of by-way
and highway
Do the trenching the low cost
Buckeye Way.

For numerous jobs needing power and speed
Here's a Buckeye machine that stays in the lead.
For earth moving, material loading, digging out rubble
Nothing equals a Buckeye "Vacuum Control" Shovel.

Your local Buckeye dealer will be glad to give you complete information on all Buckeye equipment. On road building projects of every type, Buckeye equipment today is proving itself dependable, fast, low in maintenance and operating costs. Write for bulletins on Buckeye road working machines; we'll send these and the name of your nearest dealer promptly.

BUCKEYE TRACTION DITCHER
Division of Gar Wood Industries, Inc.
FINDLAY OHIO

Cultivate Good Buying Habits . . . Now

Buckeye

GAR WOOD GW INDUSTRIES

CONVERTIBLE SHOVELS • ROAD WIDENERS • TRENCHERS • SPREADERS • FINEGRADERS

Street Improvement, Oklahoma City, Oklahoma

Continued from preceding page

BIDS: Three bids were received January 14, 1947, ranging from the contract low of $113,531.00 to $115,313.60. The low bid is 2 percent below the engineer's estimate of $116,000.00

LIST OF BIDDERS:

1. Spicers Inc., Oklahoma City, Okla. (contract)	$113,531.00
2. Earl W. Baker, Bethany, Okla.	115,081.85
3. Banta Const. Co., Oklahoma City, Okla.	115,313.60

			Unit Prices		
	Item	Quantity	Engineer's Estimate	(1)	(2)
1	Asphaltic concrete—5"	25,850 sy	$2.81	$2.80	$2.82
2	Subgrade stabilization	1,600 cy	3.20	3.10	3.10
3	Common excavation	15,000 cy	0.65	0.65	0.65
4	Curb and gutter	17,600 lf	1.35	1.25	1.35
5	Concrete curb	610 lf	1.25	1.25	1.25
6	Header curb	265 lf	0.80	0.80	0.80
7	Curb removed	310 lf	0.50	0.50	0.50
8	Single inlets	10 ea	70.00	70.00	70.00
9	Double inlets	7 ea	90.00	90.00	90.00
10	Storm sewer—15"	135 lf	2.10	2.00	2.15
11	Storm sewer—18"	66 lf	2.50	2.25	2.50
12	Manholes reset	10 ea	10.00	10.00	10.00
13	Water service—¾"	10 ea	25.00	25.00	25.00
14	Meter tile reset	10 ea	4.00	4.00	4.00
15	Meter moved and reset	10 ea	8.00	8.00	8.00
16	Valve box reset	10 ea	4.00	4.00	4.00
17	Fire hydrant reset	6 ea	60.00	60.00	60.00
18	Curb and gutter removed	260 lf	1.00	1.00	1.00
19	Culvert removed	lump sum	400.00	250.00	375.00
20	Concrete pavement—6"	36 sy	4.00	3.00	3.00

Brooklyn-Queens Connecting Highway, Brooklyn, New York

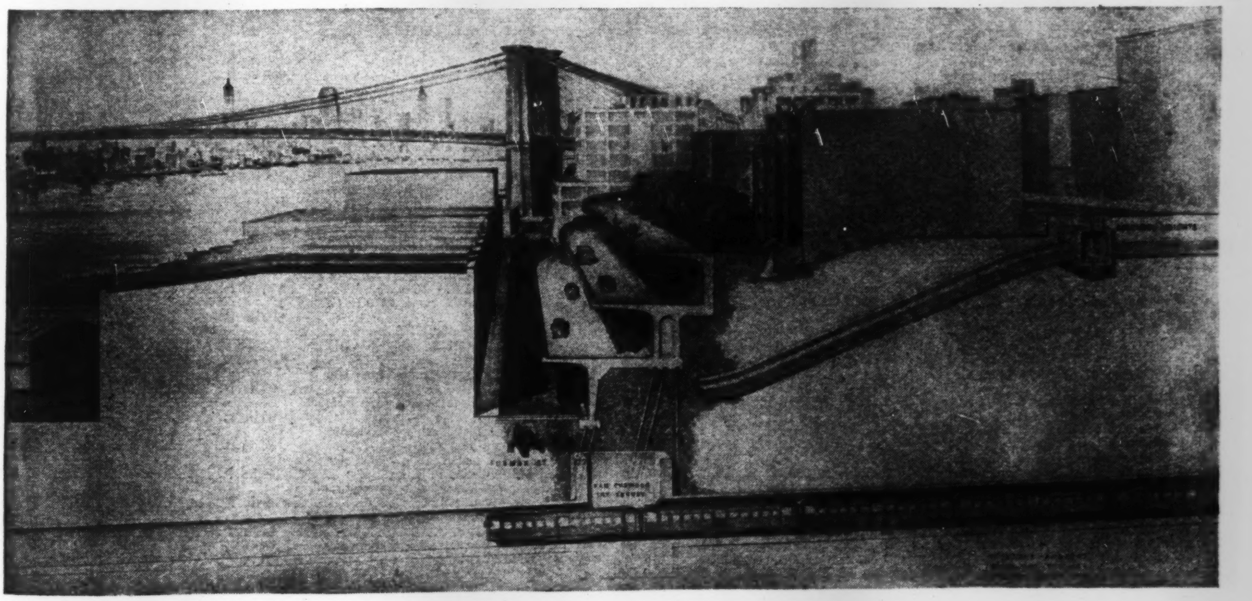
OWNER: City of New York, Office of the President of the Borough of Brooklyn, Otto Clausner, Chief Engr., Bureau of Highways and Sewers; Andrews & Clark, New York, N. Y., Consulting Engineers.

PROJECT: Construction of portion of Brooklyn-Queens Connecting Highway from a line about 105 ft. north of Joralemon St., running north on Furman St. to Pineapple St., then diagonally east to a line about 40 ft. north of Middagh St. Work consists of demolishing and removing buildings and appurtenances, grading, paving, constructing walls, viaducts, bridges, and utilities, including sewers, drainage, water mains, and lighting.

CONDITIONS: In order to preserve the industrial and commercial waterfront usage of Furman St., and the residential usage of Columbia Heights, which is located on a steep hillside, it is necessary that the highway be of triple-deck construction. Above a street-level service road, two express highways are to be cantilevered, and a promenade and park will be superimposed above. The lower highway will have an overhang of only 15½ feet, whereas the top bench supporting the promenade will have an overhang of 23½ ft. The route passes over many complicated underground utilities, including subway tubes, ventilating shafts, sewers, utility ducts, water mains, and other underground services.

If possible, demolition of the structures along Furman St. should be commenced first so that foundation and subsurface conditions will be exposed for examination by the contractor and the engineer. Tenants of the buildings facing Columbia Heights and Middagh and Willow Sts. may be permitted to remain 90 days after contract award so that demolition of those buildings may be delayed. The Montague St. section of the viaduct should also be started immediately. Rerouting of the cables of the Board of Transportation and public utility companies through the new structure must be accomplished while existing services are maintained. The Clark St. section of the viaduct also presents a similar problem. A minimum of interference with traffic must be maintained during utility and viaduct work. At least one-half of the roadways where work is not in progress must be kept clear at all times. Contractor must maintain in good condition the asphalt pavement for three years, and the granite pavement, concrete curb, concrete sidewalks, and all planting for one year after contract completion. Contract time is 720 calendar days. Failure to meet completion date will result in the assessment of liquidated damages of $500 per day. Wage rates are $2.50 per hour for power-driven shovel operating engineers, $2.25 for structural ironworkers, $2.10 for carpenters, $2.00 for electricians, $1.75 for concrete and curb form setters, $1.50 for cast iron or steel pipe layers, $1.40 for structural welders, and $0.95 for common labor.

Continued on next page



Brooklyn-Queens Connecting Highway

Continued from preceding page

BIDS: Three bids were received June 26, 1946, ranging from the contract low of $5,835,750 to $7,231,125. The low bid is 58 percent above the engineer's estimate of $3.692.000.

LIST OF BIDDERS:

1.	Del Balso Const. Corp., New York, N. Y.	$5,835,750
2.	P. J. Carlin Const. Co., Inc. and P. T. Cox Const. Co., Inc., New York, N. Y.	6,776,605
3.	Charles F. Vachris, Inc., Brooklyn, N. Y.	7,231,125

	Item	Quantity	Unit Prices		
			(1)	(2)	(3)
1.	Clearing and grubbing	lump sum	$15,000.00	$25,000.00	$60,000.00
2.	Unclassified excavation	110,000 cu. yd.	5.00	6.00	4.50
3.	Embankment in place	34,000 cu. yd.	.50	.75	2.85
7A.	Perforated vitrified pipe—6"	6,700 lin. ft.	1.00	1.20	.95
8A.	Vitrified sewer pipe—6"	200 lin. ft.	3.50	3.40	2.35
8B.	Vitrified sewer pipe—12"	750 lin. ft.	6.00	7.60	6.00
8C.	Vitrified sewer pipe—15"	2,000 lin. ft.	7.00	9.50	6.25
8D.	Vitrified sewer pipe—18"	20 lin. ft.	10.00	12.00	11.25
8E.	Vitrified sewer pipe—24"	250 lin. ft.	12.00	14.50	12.50
9B.	Concrete sewer—36"	600 lin. ft.	25.00	60.00	50.00
9D.	Concrete sewer—48"	300 lin. ft.	75.00	110.00	100.00
10A.	Cast iron sewer pipe—6"	1,300 lin. ft.	5.00	6.00	6.00
10B.	Cast iron sewer pipe—8"	750 lin. ft.	6.00	14.00	13.00
10C.	Cast iron sewer pipe—12"	130 lin. ft.	10.00	15.00	9.75
10E.	Cast iron sewer pipe—18"	70 lin. ft.	15.00	150.00	53.00
10F.	Cast iron sewer pipe—24"	70 lin. ft.	20.00	175.00	61.00
10G.	Cast iron sewer pipe—4"	120 lin. ft.	4.00	6.00	2.00
10H.	Cast iron sewer pipe—14"	20 lin. ft.	15.00	25.00	7.50
10J.	Cast iron sewer pipe—16"	20 lin. ft.	20.00	30.00	15.00
11.	Portland cement	98,500 bbl.	2.50	3.00	2.95
12.	High early strength cement	100 bbl.	4.00	4.50	4.40
13.	White portland cement	700 bbl.	7.00	8.00	9.00
14.	Natural cement	600 bbl.	3.00	4.00	3.60
15.	Structural concrete, 1:2:3½	53,400 cu. yd.	25.00	30.00	31.00
16.	First class concrete, 1:2:4	450 cu. yd.	25.00	35.00	33.00
17.	Second class concrete, 1:2½:5	4,200 cu. yd.	25.00	25.00	26.50
18.	Granite masonry	210 cu. yd.	300.00	350.00	450.00
19.	Granite veneer	102,000 sq. ft.	4.50	4.25	4.75
22.	Metal reinforcement for pavement	1,200 sq. yd.	.50	.75	.65
23.	Steel fabric reinforcement	82,000 lb.	.15	.10	.11
24.	Bar reinforcement	7,000,000 lb.	.08	.095	.09
25.	Structural steel	1,030,000 lb.	.15	.16	.19
26.	Miscellaneous iron and steel	105,000 lb.	.20	.20	.14
28.	Concrete foundation for pavement	2,000 cu. yd.	8.00	10.00	13.00
29.	Sheet asphalt pavement	3,000 sq. yd.	1.40	1.30	1.75
32.	Colored cement concrete pavement, 1:1.75:3.5	2,500 cu. yd.	10.00	18.00	20.00
33.	Granite block pavement	8,600 sq. yd.	5.00	7.50	8.70
34A.	Granite curb, type A	1,000 lin. ft.	5.50	5.75	8.70
35A.	Bluestone curb, type A	2,300 lin. ft.	3.50	4.50	6.20
36A.	Pipe railing—1½"	100 lin. ft.	4.50	6.50	8.25
37.	Concrete curb	500 cu. yd.	20.00	36.00	45.00
38A.	Reset old curb, type A	2,000 lin. ft.	2.50	2.95	5.00
40B.	Metal rail, type MB	420 lin. ft.	18.00	18.00	23.50
40C.	Metal rail, type MC	5,200 lin. ft.	15.50	18.00	21.00
40E.	Metal rail, type ME	2,000 lin. ft.	25.00	28.00	32.50
43.	Screened gravel	100 cu. yd.	6.00	7.50	6.50
44.	Bagged screened gravel	4,400 cu. yd.	7.00	11.00	14.00
45.	Joint supports	200 ea.	.75	.50	.60
46.	Bituminous material waterproofing	1,200 gal.	.75	.80	.75
47.	Membrane waterproofing—3 ply	20,000 sq. yd.	2.00	2.25	2.40
47A.	Membrane waterproofing—5 ply	100 sq. yd.	4.00	5.00	5.00
48.	Membrane waterproofing—prot. course, 3 ply	22,000 sq. yd.	3.50	3.30	3.65
49.	Timber sheet piling	2 M ft. BM	250.00	400.00	325.00
50.	Steel sheet piling	52,000 lb.	.10	.10	.09
51.	Temporary steel sheet piles	108,000 sq. ft.	.25	1.50	1.60
52.	Temporary sheeting and bracing	40 M ft. BM	200.00	200.00	135.00
53.	Permanent sheeting and bracing	10 M ft. BM	250.00	275.00	230.00
54.	Timber piles	4,200 lin. ft.	1.50	3.00	1.55
55.	Creosoted timber piles	500 lin. ft.	2.00	5.00	2.35
56.	Timber test piles	100 lin. ft.	10.00	10.00	12.50
57.	Concrete test piles	600 lin. ft.	15.00	16.00	25.00
59A.	Cast-in-place concrete piles—8" tip	38,000 lin. ft.	3.00	3.30	5.00
59B.	Cast-in-place concrete piles—12" tip	59,000 lin. ft.	3.50	3.30	6.75
59C.	Cast-in-place concrete piles—10" tip	3,500 lin. ft.	3.50	3.30	5.85
60.	Load test for piles	2 ea.	750.00	1,000.00	750.00
61.	Load test for soils	2 ea.	1,000.00	600.00	500.00
63.	Emulsified carbon black	28,000 lb.	.10	.07	.11
64.	Concrete sidewalk	4,500 sq. yd.	3.00	4.00	5.10
65B.	Drop inlets, type B	24 ea.	250.00	175.00	142.00
65H.	Drop inlets, type H	1 ea.	250.00	200.00	180.00
66A.	Catch basins, type A	5 ea.	350.00	350.00	505.00
66B.	Catch basins, type B	1 ea.	350.00	350.00	540.00
67B.	Sewer manholes, type B	8 ea.	300.00	250.00	345.00
67C.	Sewer manholes, type C	2 ea.	350.00	250.00	435.00
67D.	Sewer manholes, type D	22 ea.	350.00	500.00	550.00
67E.	Sewer manholes, type E	4 ea.	350.00	250.00	250.00
67F.	Sewer manholes, type F	1 ea.	350.00	300.00	500.00
67G.	Sewer manholes, type G	2 ea.	450.00	300.00	350.00
67K.	Drop manholes	3 ea.	10,000.00	8,000.00	6,650.00
68B1.	Steel pipe conduit, 1½"	50 lin. ft.	1.50	.80	2.10
69A.	Remove and reset fire alarm posts	1 ea.	50.00	40.00	200.00
69B.	Wrought iron pipe conduit, 3"	900 lin. ft.	2.50	3.60	4.35
69C2.	Furn. install F. A. Cable, 8-wire	1,200 lin. ft.	1.60	1.50	3.00
69D.	Fire alarm manhole	5 ea.	350.00	300.00	265.00
69F.	Cast iron pull box, 18" x 18" x 12"	1 ea.	150.00	130.00	150.00
69T.	Temporary fire alarm facilities	lump sum	10,000.00	1,500.00	7,000.00
70A.	Temporary light pole	24 ea.	150.00	200.00	350.00
70B.	Temporary overhead wire	10,000 lin. ft.	.60	.10	.15
70C.	Temporary barricade lighting	20 ea.	350.00	750.00	590.00
70D.	Unit change of barricade lighting	20 ea.	200.00	75.00	33.50
70G1.	Furnish & install lighting standards & luminaires, type 41S	7 ea.	525.00	700.00	540.00
70G3.	Furnish & install lighting standards & luminaires, type B	38 ea.	225.00	250.00	245.00
70H.	Install lighting standards	28 ea.	125.00	100.00	160.00
70J1.	Luminaires, type A (bridge underdeck)	118 ea	90.00	85.00	105.00
70J2.	Luminaires, type B (bridge underdeck)	66 ea	75.00	70.00	95.00
70P1.	Concrete service boxes, type 1	18 ea	75.00	80.00	115.00
70P2.	Concrete service boxes, type 2	11 ea.	100.00	120.00	175.00
70P4.	Concrete service boxes, type 4	2 ea.	125.00	140.00	225.00
70R4.	Cast iron pull boxes, 16" x 16" x 12"	38 ea.	150.00	130.00	260.00
70R9.	Cast iron pull boxes, 36" x 18" x 16"	3 ea	400.00	170.00	580.00
70V.	Control cabinets, 3 relays	3 ea.	1,300.00	750.00	876.00
70V1.	Control cabinets, 6 relays	1 ea.	1,500.00	1,100.00	2,200.00
70X2.	Steel conduit, 1"	5,500 lin. ft.	.80	.60	1.35
70X3.	Steel conduit, 1¼"	2,400 lin. ft.	.85	.80	1.45
70X4.	Steel conduit, 1½"	2,950 lin. ft.	1.50	.90	1.85
70X5.	Steel conduit, 2"	1,500 lin. ft.	1.75	2.10	2.50
70X6.	Steel conduit, 3"	3,500 lin. ft.	2.50	2.60	3.00
70X7.	Steel conduit, 4"	6,700 lin. ft.	3.50	3.70	5.50
70Y4.	Furnish & install conductor, # 6 B & S, bare	600 lin. ft.	.15	.20	.22
70Y6.	Furnish & install conductor, # 2 B & S, bare	850 lin. ft.	.20	.40	.27
70Y7.	Furnish & install conductor, #2/0 B & S, bare	3,000 lin. ft.	.35	.30	.33
70Y8.	Furnish & install conductor, #4/0 B & S, bare	350 lin. ft.	.65	.40	.44
70Z1.	Furnish & install conductor, #12 B & S, RCL	18,000 lin. ft.	.20	.20	.20
70Z4.	Furnish & install conductor, #6 B & S, RCL	1,500 lin. ft.	.35	.45	.72
70Z6.	Furnish & install conductor, #2 B & S, RCL	3,000 lin. ft.	.60	.75	.78
70Z7.	Furnish & install conductor, #2/0 B & S, RCL	8,000 lin. ft.	.80	.75	.87
70Z8.	Furnish & install conductor, #4/0 B & S, RCL	1,000 lin. ft.	1.00	1.10	1.15
70AA.	Astronomical time switches	28 ea.	50.00	50.00	38.00
71A1.	Furnish & lay steel water pipe, 12"	120 lin. ft.	30.00	30.00	24.00
71B1.	Furnish & lay steel water pipe encased, 12"	110 lin. ft.	30.00	35.00	26.50
71C1.	Furn. & lay c. i. water pipe, 6"	80 lin. ft.	10.00	12.00	11.50
71D2.	Remove cast iron water pipe, 12"	2,500 lin. ft.	4.00	4.50	6.70
71E2.	Lay cast iron water pipe, 12"	200 lin. ft.	3.80	4.50	8.40
71F1.	Furnish & install valves, 6"	1 ea.	100.00	100.00	125.00
71G.	Remove hydrant assemblies	9 ea.	60.00	100.00	195.00
71H.	Install hydrant assemblies	2 ea.	150.00	200.00	225.00
71J.	Rem. high press. hydrant assem.	14 ea.	100.00	150.00	260.00
71K.	Install high press. hydrant assem.	12 ea.	250.00	300.00	500.00
71L3.	Furnish & lay high pressure cast iron water pipe, 20"	500 lin. ft.	30.00	35.00	48.75
71M1.	Remove high pressure cast iron water pipe, 12"	150 lin. ft.	4.25	5.00	7.50
71M3.	Remove high pressure cast iron water pipe, 20"	2,200 lin. ft.	5.00	6.00	11.00
71N1.	Install high pressure cast iron water pipe, 12"	100 lin. ft.	5.50	6.00	6.30
71N3.	Install high pressure cast iron water pipe, 20"	1,800 lin. ft.	6.25	6.50	13.00
71P1.	Furnish & install high pressure valves, 12"	1 ea.	750.00	750.00	900.00
71P3.	Furnish & install high pressure valves, 20"	2 ea.	1,800.00	2,000.00	2,700.00
71S.	Reset existing hydrant	6 ea.	80.00	100.00	440.00
71U2.	Install valves, 12"	1 ea.	75.00	100.00	95.00
71X3.	Install high pressure valves, 20"	6 ea.	300.00	400.00	375.00
71Z.	Furnish & install air cocks	2 ea.	100.00	100.00	80.00
73.	Cinders	50 cu. yd.	5.00	3.00	3.75
78.	Park benches	100 lin. ft.	10.00	8.00	8.75
79.	Stone block pavement	500 sq. yd.	5.00	4.00	8.75
83.	Sewer risers	50 lin. ft.	5.00	20.00	8.75
84.	Adjust manhole and basin heads	3 ea.	25.00	50.00	50.00
94.	Pile shoes	200 ea.	5.00	2.50	2.00
96A.	Steel H piles, 12" x 74 lb	1,100 lin. ft.	4.50	5.00	7.00
96B.	Steel H piles, 14" x 102 lb	66,000 lin. ft.	4.50	6.00	7.20
97A.	Maintain, protect & revise transit facilities	lump sum	50,000.00	40,000.00	40,000.00
97D3.	New duct line, 12 ducts	150 lin. ft.	20.00	10.00	13.75
97D6.	New duct line, 24 ducts	200 lin. ft.	30.00	15.00	20.00
97E.	Remove cable	5,300 lin. ft.	1.00	1.20	2.70
97G2.	Furnish & install cable, 500,000 CM	2,300 lin. ft.	2.00	2.10	3.40
97G4.	Furnish & install cable, 250,000 CM	500 lin. ft.	2.00	1.30	2.15
97G6.	Furnish & install cable, telephone, 124 pair—quad. type	500 lin. ft.	2.50	1.60	5.10
97G7.	Furnish & install cable, telephone, 100 pair—(80–#19 & 20–#16)	1,000 lin. ft.	2.25	1.80	4.90
97G8.	Furnish & install cable, 18 conductor (5–#10 & 13–#16) R. I. L. C.	1,500 lin. ft.	1.50	1.70	2.00
97G9.	Furnish & install cable, 3 conductor #6 shielded P. I. L. C	500 lin. ft.	3.00	3.60	23.00
97G10.	Furnish & install cable, #4/0 R. C. L. C. 600 v	800 lin. ft.	1.00	1.40	2.30
97G11.	Furnish & install cable, 2 conductor (200,000 CM & 750,000 CM) P. I. L. C	500 lin. ft.	16.00	9.00	19.75
97G12.	Furnish & install cable, 2,000,000 CM P. I. L. C	300 lin. ft.	10.00	7.50	16.50
97G13.	Furnish & install cable, #4/0 P. I. L. C	100 lin. ft.	2.50	3.50	12.50
97G14.	Furnish & install cable, 3 conductor #3/0 shielded P. I. L. C	50 lin. ft.	12.00	6.50	26.00
97G15.	Furnish & install cable, 3 conductor #4/0 shielded P. I. L. C	250 lin. ft.	12.00	6.50	27.09
97G16.	Furnish & install cable, 14 conductor, #14 R. I. L. C	50 lin. ft.	5.00	7.00	21.00
97G17.	Furnish & install cable, 20 pair, #19 solid P. I. L. C	50 lin. ft.	4.00	4.00	25.00
97G18.	Furnish & install cable, 90 pair. #19 solid P. I. L. C	50 lin. ft.	8.00	6.20	26.00

Continued on next page

Brooklyn-Queens Connecting Highway

Continued from preceding page

97G19. Furn. & install cable, 4 cond. #4/0 R. I. L. C. (Neoprene sheath)	50 lin. ft.	15.00	12.00	27.00
97H2. B. of T. manholes, type K	2 ea.	750.00	1,500.00	1,750.00
97J. Alter B. M. T. manholes	2 ea.	1,000.00	900.00	1,100.00
97K. Pull boxes, 36" x 36" x 12"	1 ea.	350.00	330.00	185.00
98. Concrete guide railing	160 lin. ft.	20.00	15.00	10.00
100. Demolition	lump sum	250,000.00	264,000.00	200,000.00
101. Stone masonry	750 cu. yd.	100.00	115.00	130.00
102. Hexagonal block surfacing	2,500 sq. yd.	4.00	4.00	7.50
103. Bluestone surfacing	3,000 sq. yd.	16.00	13.00	15.50
104. Timber and lumber	10 M ft. BM	200.00	250.00	250.00
105. Creosoted timber and lumber	2 M ft. BM	300.00	450.00	350.00
109. Underpinning	lump sum	150,000.00	150,000.00	25,000.00
112. Alteration to subway vent building	lump sum	125,000.00	100,000.00	100,000.00
121. Alteration of Clark St. vent. shaft	lump sum	15,000.00	25,000.00	21,000.00
123. Louvres-Montague St. vent. bldg.	lump sum	25,000.00	30,000.00	32,000.00
129. Steel H test piles	200 lin. ft.	10.00	20.00	25.00
133. Cement grout	20 cu. yd.	30.00	30.00	25.00
135. Pavement cores	15 ea.	20.00	52.00	50.00

Bridge over Stony Creek, Anne Arundel Co., Maryland

OWNER: Maryland State Roads Commission, Walter C. Hopkins, Bridge Engineer.

PROJECT: Construction of bridge over Stony Creek, near Riviera Beach, Maryland. Bridge to be of steel I-beam construction with steel girder bascule span allowing 40 ft. of clear channel and concrete floor on fixed spans. Total length of bridge, center to center end bents, 885 ft.; approach spans to be approximately 54 ft., center to center bents.

CONDITIONS: Transportation to the job site either by the Fort Smallwood Road (Route 173) to Stony Creek or by water from Chesapeake Bay. Contract time is 300 working days. Prevailing wages for structural ironworkers are $1.90 per hour, for hoisting engineers, $1.625 to $2.00, and for common labor, $0.95.

BIDS: Four bids were received August 13, 1946, ranging from the contract low of $794,274 to $1,045,311.

LIST OF BIDDERS:

1. Whiting-Turner Contracting Co., Baltimore, Md. (contract)	$794,274.00
2. McLean Contracting Co., Baltimore, Md.	842,494.90
3. Baltimore Contractors, Inc., Baltimore, Md.	1,023,588.00
4. Empire Construction Co., Baltimore, Md.	1,045,311.00

		Unit Prices		
Item	Quantity	(1)	(2)	(3)
1. Clearing and grubbing	lump sum	$1,884.00	$400.00	$10,000.00
2. Class no. 1 excavation	3,700 cy	1.26	.70	.80
3. Class no. 2 excavation	500 cy	2.00	2.00	1.50
4. Class no. 5 excavation	50 cy	4.00	4.00	2.00
5. Borrow excavation	29,800 cy	.78	.80	1.10
6. Tamped fill	400 cy	1.50	1.50	1.00
7. Sodding	900 sy	.90	1.00	.80
8. Trimming exist. ditches	500 lf.	.35	.25	.40
9. Removal of exist. pavement	2,200 sy	.90	.80	1.20
10. Removal of exist. bridge	lump sum	11,011.00	15,000.00	27,000.00
11. Macadam base course	10,300 sy	1.05	1.10	1.30
12. Screen. for mac. base crse	850 ton	3.78	4.00	4.00
13. Calcium chloride	6 ton	52.50	50.00	50.00
14. Gravel surf. main. traf	200 cy	3.70	2.00	4.00
15. Gravel surf. crse.-entr	400 sy	.76	.80	.80
16. Gravel surf. crse.-shldr	5,700 sy	.76	.60	.80
17. Penetr. mac. surf. crse-3"	10,300 sy	.81	.80	1.30
18. Bit. mat. for penetr. mac.	37,800 gal	.126	.13	.14
19. Bit. surf. crse-spec. C	175 ton	12.35	13.00	8.00
20. Top dressing	9 ton	11.60	12.00	10.00
21. Perf. corr. met. pipe underdrain-6".	200 lf	1.58	1.25	1.50
22. Corr. met. pipe outlets-6" underdrain	50 lf	1.58	1.20	1.50
23. Arc. sec. cor. met. pipe 18" x 11" A. C.	194 lf.	2.63	3.60	3.50
24. Arc. sec. corr. met. pipe 29" x 18" A. C.	36 lf	3.68	6.00	5.00
25. 18" diam. A. C. C. M. pipe	60 lf	2.75	3.50	3.00
26. 24" diam. A. C. C. M. pipe	182 lf	4.20	6.00	4.00
27. Remove old pipe culverts	100 lf	1.10	2.00	1.00
28. Relaid old pipe culverts	100 lf	1.10	3.00	1.50
29. Aggreg. backfill underdrain	30 cy	4.50	6.00	3.50
30. Timber test piles	230 lf	5.60	3.00	4.00
31. Tr. Cl. A timber piles	8,400 lf	3.60	3.00	4.50
32. Prec. concr. test piles	680 lf	21.00	20.00	20.00
33. Prec. concrete piles	13,500 lf	13.65	11.50	18.00
34. Test loads	2 ea	3,150.00	3,000.00	5,000.00
35. Class X concrete	530 cy	49.75	75.00	75.00
36. Class A concrete	1,425 cy	67.90	68.50	60.00
37. Concrete in barricades	20 cy	60.00	50.00	40.00
38. Concrete in counterweights	60 cy	41.50	50.00	45.00
39. Cl. A concr. in pipe endw.	20 cy	50.00	60.00	60.00
40. Reinforcing steel bars	300,000 lb	.0655	.10	.25
41. Fabr. struct. steel bascule span, etc.	335,000 lb	.181	.20	.12
42. Fabr. struct. steel fl. span and appr. span	835,000 lb	.108	.13	.15
43. Misc. metal	14,000 lb.	.342	.60	.50
44. Stringer spirals	14,000 lb	.50	.75	.75
45. Open grating in roadway	1,490 sf	4.60	6.50	4.50
46. Open grating in sidewalk	420 sf	4.90	7.00	4.00
47. Filled grating in sidewalk	110 sf	8.82	10.00	8.00
48. Trunnions and bearings	12,000 lb	.67	.75	.80
49. Operating machinery	35,000 lb	1.054	1.00	1.20
50. Cast iron balance blocks	20,000 lb	.065	.15	.15
51. Water service line	lump sum	3,361.00	5,000.00	3,575.00
52. Treated timber	11 Mbm	638.50	600.00	450.00
53. Dampproofing	lump sum	235.00	500.00	200.00
54. Exp. mat. in bridge	lump sum	612.00	50.00	300.00
55. Electrical work	lump sum	44,000.00	55,000.00	56,800.00
56. Control house	lump sum	18,166.00	25,000.00	36,500.0
57. Metal railing	1,600 lf	10.75	10.00	8.00
58. Concrete gutter 8"	75 sy	4.20	5.00	16.00
59. White face comb. curb and gutter	240 lf	2.42	2.50	8.00
60. Riprap	500 sf	10.00	25.00	6.00
61. Guard rail-3-cable	1,888 lf	1.58	1.75	3.00
62. End anchor for grd. rail	10 ea	42.00	50.00	45.00
63. Interm. anchor for grd. rail	1 ea	95.00	100.00	80.00
64. Maintenance of traffic	lump sum	6,506.00	3,000.00	10,000.00
65. Grates for type J inlets	2 ea	210.00	100.00	75.00
66. White cem. concr. curb 8" x 22"	200 lf	2.35	2.50	3.50
67. Seeding and mulching	6,800 sy	.32	.25	.30

Bridge, Monroe County, Indiana

OWNER: State Highway Commission, Indianapolis, Indiana; C. E. Vogelsang, Engineer.

PROJECT: Construction of reinforced concrete girder bridge with 2-40 ft. spans over Beaumont Creek in Monroe County, Indiana. Roadway to be 28 ft. wide. Approach of .511 mi. must be graded and coated with compacted aggregate with bituminous palliative surfacing.

CONDITIONS: Access to job site is by highway only. Site is 1.2 miles east of State Road 43. All materials to be furnished by contractor. Contract time is 200 calendar days. Skilled wages approximate $1.05 per hour; semi-skilled, $0.95 per hour; and common labor, $0.90 per hour.

BIDS: Three bids were received October 29, 1946. ranging from the contract low of $57,143.47 to $60,192.05. The low bid was 12 percent below the engineers estimate of $64,602.75.

LIST OF BIDDERS:

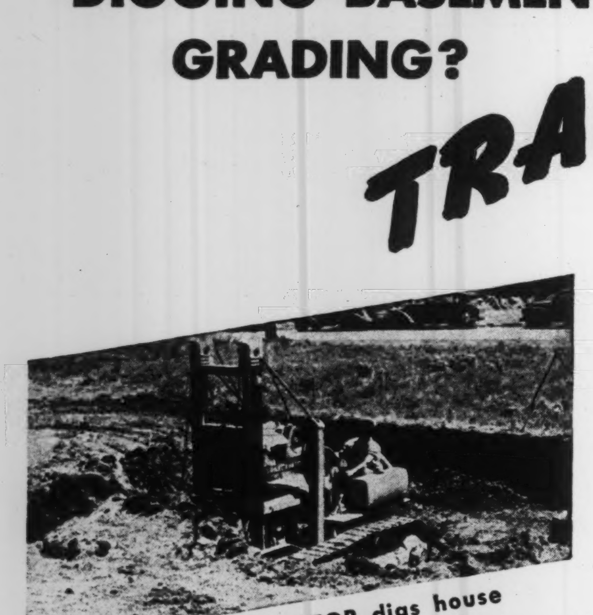
1. G. H. Allen, Vincennes, Ind. (contract)	$57,143.47
2. Robert H. King, Danville, Ind.	57,737.75
3. Rieth-Riley Const. Co., Goshen, Ind.	60,192.05

		Unit Prices		
Item	Quantity	Engineer's Estimate	(1)	(2)
1 Class D concrete	175.2 cy	$50.00	$46.00	$50.00
2 Class E concrete above footings	115 cy	50.00	46.00	45.00
3 Class E concrete in footings	80.2 cy	45.00	46.00	45.00
4 Handrail	174 lf	7.00	6.00	6.00
5 Reinforcing steel	50,645 lb	.09	.085	.08
10 Cast iron	533 lb	.30	.25	.30
11 Wet excavation	147 cy	10.00	6.00	10.00
12 Waterway excavation	5,825 cy	.75	.60	.65
13 Common excavation	5,700 cy	.60	.60	.65
14 Special borrow	2,990 cy	.70	.60	.70
15 Special filling material	1,335 cy	2.00	2.50	2.50
16 Sodding	2,665 sy	.50	.40	.40
20 Thickened reinforced concr. pavement	131 sy	5.00	5.00	4.00
21 Removal present structure	lump sum	1,250.00	500.00	500.00
23 Mulched seeding	14,000 sy	.15	.10	.10
24 Class X excavation	52 cy	15.00	15.00	10.00
25 Class Y excavation	25 cy	5.00	15.00	2.00
26 Paved side ditch type A	121 lf	2.00	1.50	.200
27 Paved side ditch type F	38 lf	4.50	4.00	4.50
28 Compacted aggregate surface—9"	6,680 sy	2.25	1.90	1.75
29 Corrugated metal pipe—12"	20 lf	2.25	2.00	2.00
30 Corrugated metal pipe—15"	20 lf	2.65	2.50	2.50
31 Corrugated metal pipe—18"	28 lf	3.00	2.75	3.00
32 Corrugated metal pipe—24"	20 lf	4.25	4.00	4.00
33 Pipe—12"	70 lf	2.35	2.00	2.00
34 Pipe—15"	72 lf	2.75	2.50	2.50
35 V.c., r. c., c. i., or c. m. pipe—36"	132 lf	8.00	7.50	8.00
37 Pref. bitum. expansion joint—1"	51 lf	.80	.50	1.00
38 Finishing shoulders and ditches	2,600 lf	.35	.20	.40
39 Flexible steel plate guard rail	272 lf	3.00	2.25	2.00
40 Aggregate for shoulder drains	25 ton	5.00	4.00	4.00
41 Compacted aggregate surface—6"	319 sy	1.75	1.50	1.50
42 Standard signs (4' x 4')	12 ea	40.00	35.00	30.00
43 Standard barricades	3 ea	75.00	60.00	60.00

DIGGING BASEMENTS?
GRADING?

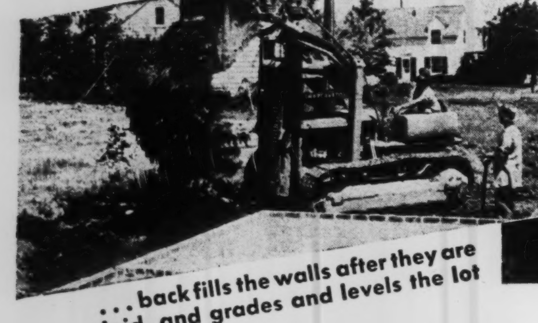
TRAXCAVATE!

IT'S THE PROFITABLE WAY TO MOVE THE EARTH



The TRAXCAVATOR digs house basements fast and efficiently . . .

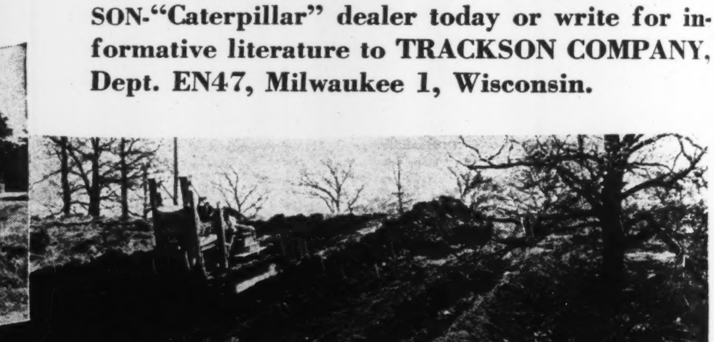
. . . carries and dumps the dirt where wanted or loads directly into trucks . . .



. . . back fills the walls after they are laid, and grades and levels the lot

TRAXCAVATORS are profitable equipment to have on your side. They pay off in more work on more jobs, at lower cost. Their versatility is practically unlimited when there's earth to be moved or material handled. Whether you're doing excavating and grading work for single houses or large housing projects, TRAXCAVATORS' performance is an honest-to-goodness time and labor-saver. Digging, loading, grading, carrying, leveling, backfilling are only a few of the tasks you can assign to these rugged, multi-purpose machines.

TRAXCAVATORS are built in four sizes for every job and purpose—with bucket capacities from ½ to 4 cubic yards. Each is a balanced unit with the sturdy "Caterpillar" track-type tractor by which it is powered. Available interchangeable attachments increase the work-potential of these profit-building machines. See your TRACKSON-"Caterpillar" dealer today or write for informative literature to TRACKSON COMPANY, Dept. EN47, Milwaukee 1, Wisconsin.



Big T7 TRAXCAVATOR grading and landscaping residential grounds in a Minneapolis suburb

DIGS
GRADES
LOADS
CARRIES

TRAXCAVATOR

REG. U. S. PAT. OFF.

THE ORIGINAL TRACTOR EXCAVATOR

Bridge and Substructures, Kern Co., California

OWNER: Division of Highways, Sacramento, California; G. T. McCoy, State Highway Engineer.

PROJECT: Construction of one concrete bridge and substructures for four additional bridges, and grading and bituminous surfacing of 10.2 miles. Site is between Keene and Telechapi in Kern County.

CONDITIONS: The State will furnish all material for inside steel guard rails and railroad rails. Access to job site is available by both railroad and highway. Contract time is 350 working days. Minimum wage rates are: common labor, $1.15 per hour; semi-skilled labor, $1.15; and skilled labor, $1.375.

BIDS: Nine bids were received December 1, 1946, ranging from the contract low of $1,096,600.00 to $1,573,128.95.

LIST OF BIDDERS:

1. Guy F. Atkinson Co., South San Francisco, Calif. (contract)	$1,096,600.00
2. M. M. Ball Sons, Berkeley, Calif.	1,173,519.30
3. Winston Bros. Co., Los Angeles, Calif.	1,212,284.80
4. Bressi & Bevanda Constructors, Inc., Los Angeles Calif.	1,239,881.30
5. Morrison-Knudsen. Inc., Los Angeles, Calif.	1,295,889.90
6. A. Teichert & Sons, Inc., Sacramento, Calif.	1,299,277.80
7. Clyde W. Wood, Inc., North Hollywood, Calif.	1,368,678.00
8. Vinnell Co., Alhambra, Calif.	1,530,121.80
9. Haddock Engineers, Ltd., Oceanside, Calif.	1,573,128.95

Item	Quantity	Unit Prices (1)	Unit Prices (2)	Unit Prices (3)
1 Clearing and grubbing	lump sum	$14,000.00	$15,000.00	$4,000.00
2 Roadway excavation	555,000 cy	.57	.78	.71
3 Structure excavation	15,500 cy	2.25	1.90	3.00
4 Bridge structure excavation	2,575 cy	5.00	11.00	4.30
5 Ditch and channel excavation	4,230 cy	1.50	2.00	2.10
6 Trench excavation	8,500 cy	1.25	1.50	1.20
7 Overhaul	5,090,000 st y	.005	.008	.006
8 Compacting original ground	28,500 sy	.05	.03	.04
9 Imported borrow	62,000 cy	.90	.95	.90
10 Developing water supply and furnishing water equipment	lump sum	5,000.00	3,000.00	3,000.00
11 Applying water	4,310,000 gal	2.50	1.90	3.25
12 Finishing roadway	541 st	15.00	10.00	15.00
13 Preparing mixture and shaping surface (bit. surf. tr.)	194,000 sy	.10	.065	.12
14 Liquid asphalt SC-4 (bit. surf. tr.)	2,020 ton	16.00	16.00	16.00
15 Cl. "A" portland cement concrete (structure)	1,495 cy	55.00	50.00	55.00
16 Cl. "A" portland cement concrete (footing blocks)	152 cy	30.00	30.00	40.00
17 Cl. "A" Portland cement concrete (trash racks)	10 cy	95.00	63.00	80.00
18 Cl. "C" Portland cement concrete	335 cy	40.00	30.00	40.00
19 Portland cement concrete walls	4,000 cy	31.00	26.00	32.00
20 Furnishing bar reinforcing steel	186,700 lb	.065	.08	.06
21 Placing bar reinforcing steel	186,700 lb	.045	.02	.04
22 Placing railroad rails	95,000 lb	.05	.04	.04
23 Timber bridge railing	44 lf	6.00	4.00	4.00
24 Miscellaneous steel	3,980 lb	.50	.50	.40
25 Furnishing steel piling	2,050 lf	3.25	4.00	3.00
26 Driving steel piles	64 ea	75.00	125.00	75.00
27 Steel pile splices	7 ea	25.00	23.00	25.00
28 Inside steel guard rail	lump sum	2,000.00	2,500.00	900.00
29 Pneumatically applied mortar	6,000 sf	.50	.25	.40
30 Cast steel frames and covers	1 ea	100.00	80.00	150.00
31 Rubble masonry	2,412 cy	31.50	27.00	40.00
32 Rubble masonry slope paving	2,800 cy	32.00	20.00	28.00
33 Portland cement concrete curbs	30 cy	50.00	40.00	40.00
34 Monuments	205 ea	5.50	7.50	8.00
35 Metal plate guard railing	660 lf	4.50	3.00	2.50
36 Culvert markers	100 ea	4.50	5.00	4.50
37 Guide posts	275 ea	5.50	5.00	5.00
38 New property fence, type A	15.5 mi	1,150.00	2,700.00	2,200.00
39 New property fence, type B	3.0 mi	1,150.00	2,700.00	2,200.00
40 Removing and reconstructing existing property fence	0.5 mi	1,150.00	1,200.00	1,900.00
41 Drive gates	35 ea	50.00	75.00	100.00
42 8" corrugated metal pipe down drains (16 gauge)	3,450 lf	1.50	2.10	1.50
43 24" corrugated metal pipe (14 guage)	1,426 lf	4.25	4.20	3.80
44 30" corrugated metal pipe (14 guage)	292 lf	5.75	5.30	5.00
45 36" corrugated metal pipe (10 guage)	150 lf	9.50	8.60	9.00
46 36" corrugated metal pipe (8 guage)	216 lf	12.00	10.50	10.00
47 48" corrugated metal pipe (8 guage)	524 lf	15.50	14.00	14.50
48 90" field assembled plate culverts (512–18)	60 lf	60.00	36.00	25.00
49 Rock filling material	5,500 cy	7.50	5.60	8.00
50 Spillway assemblies	80 ea	32.50	37.00	30.00
51 Salvaging existing pipe culverts	38 lf	2.50	1.00	2.00
52 Relaying salvaged corrugated metal pipe	38 lf	2.50	1.00	2.00
53 Engineers office	lump sum	5,000.00	3,000.00	2,500.00

Schooner Creek Bridge, Lincoln County, Oregon

OWNER: Public Roads Administration, Dist. 1, Portland, Oregon, W. H. Lynch, Div. Engr.

PROJECT: Continuous concrete T-beam design bridge of two 70 ft. and two 57½ ft. spans with a 15 ft. cantilever span at each end. Bridge to be 286 ft. long, 26 ft. wide, with 2-4 ft. sidewalks. Approach grading of 1.749 mi. and surfacing of 2.040 mi.

CONDITIONS: Transportation by Oregon Coast Highway. Contract time, 210 calendar days. Skilled wage rates, $2.15 per hr. and common wage rates, $1.15 per hr.

BIDS: Only two bids were received May 22, 1946 at Portland, Ore. resulting in the subsequent award of the contract for $92,080.20.

LIST OF BIDDERS:

1. C. J. Eldon, Portland, Ore. (contract)	$92,080.20
2. Lookyear & White, Inc., Seattle, Wash.	99,915.00

Item	Quantity	Unit Prices (1)	Unit Prices (2)
1. Extra & misc. force account work	All reqd.	$250.00	$250.00
2. Unclassified excavation for structures	600 cu. yds.	16.00	10.00
3. Concrete class A	1,100 cu. yds.	48.00	54.00
4. Concrete class S	237 cu. yds.	30.00	54.00
5. Reinforcing steel	159,000 lbs.	.085	.08
6. Structural steel, furn., fabr. & erected	9,500 lbs.	.40	.40
7. Steel handrail	582 lin. ft.	8.60	8.50

Three Bridges over Caney River, near Bartlesville, Oklahoma

OWNER: State Highway Department, Oklahoma City, Okla.; H. E. Bailey, Engineer.

PROJECT: Construction of three reinforced concrete bridges over Caney River near Bartlesville, Oklahoma. Bridges, of "I" beam girder construction, are to be 160 ft., 240 ft., and 180 ft. long respectively.

CONDITIONS: Area is subject to flash floods. Access to job site is provided by U. S. Highways 60 and 66. The Santa Fe and Katy Railroads serve Bartlesville which is 2 miles from the projected bridges. Contract time is 8 months. Skilled wages approximate $1.50 per hour, semi-skilled, $1.00, and common labor, $.75.

BIDS: Only two bids were received September 24, 1946, the low bid of $262,262.88 and $289,005.28.

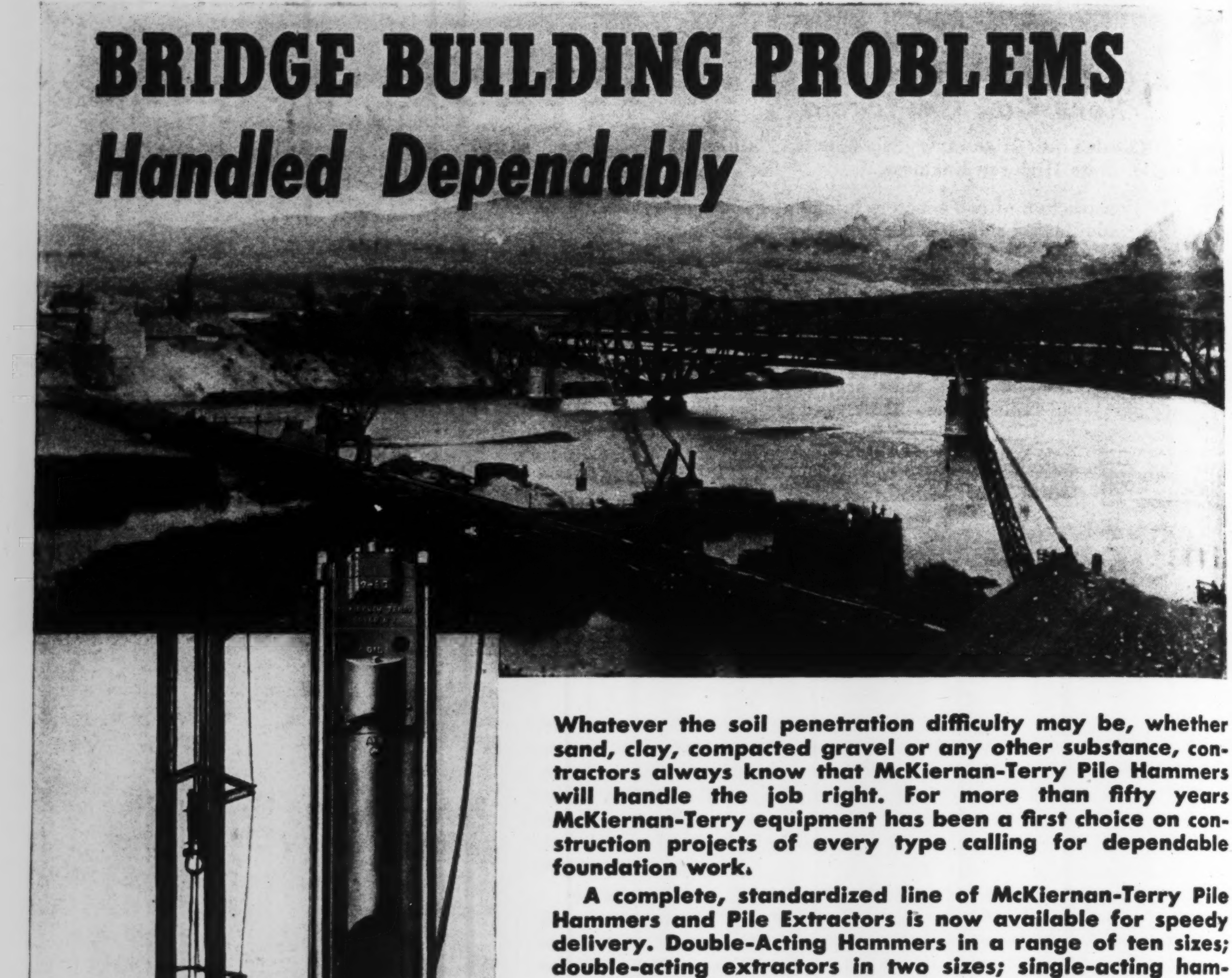
LIST OF BIDDERS:

1. J. A. Raines, Muskogee, Okla. (contract)	$262,262.88
2. Gordon Walker, Baton Rouge, La.	289,005.28

Item	Quantity	Unit Prices (1)	Unit Prices (2)
Bridge # 1			
1 Substructure excavation common	325 cy	$7.63	$3.85
2 Class A concrete	201.2 cy	37.00	36.00
3 Class AA concrete	899.1 cy	37.70	46.00
4 Reinforcing steel	223,910 lb	.10	.077
5 Concrete test pile	2 ea	550.00	700.00
6 Reinforced concrete piling	4,695 lf	6.15	5.00
7 Black traffic stripe—6"	501.33 lf	.20	.25
8 Black traffic stripe—24"	1,002.66 lf	.40	.50
Bridge # 2			
9 Substructure excavation common	6,090 cy	7.63	5.85
10 Substructure excavation rock	261.6 cy	24.00	15.00
11 Class A concrete	551.9 cy	37.00	35.00
12 Class A concrete pier base	563.8 cy	39.00	37.00
13 Class AA concrete	82.4 cy	37.70	46.00
14 Reinforcing steel	93,850 lb	.10	.077
15 Reinforced concrete piling	1,276 lf	6.15	5.00

Continued on next page

BRIDGE BUILDING PROBLEMS
Handled Dependably



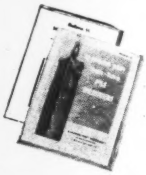
McKiernan-Terry Pile Hammers driving semi-circular double wall coffers in cemented volcanic gravel and boulders during construction of Santa Fe Railroad bridge (in foreground of upper photo), at Topock, Arizona. Highway bridge shown in background.

Whatever the soil penetration difficulty may be, whether sand, clay, compacted gravel or any other substance, contractors always know that McKiernan-Terry Pile Hammers will handle the job right. For more than fifty years McKiernan-Terry equipment has been a first choice on construction projects of every type calling for dependable foundation work.

A complete, standardized line of McKiernan-Terry Pile Hammers and Pile Extractors is now available for speedy delivery. Double-Acting Hammers in a range of ten sizes; double-acting extractors in two sizes; single-acting hammers in five sizes.

PILE HAMMER DATA FOR YOUR FILES

Write for McKiernan-Terry Pile Hammer Bulletins No. 55 and No. 57, and keep this valuable pile-driving information handy. Send today.



McKIERNAN-TERRY CONSTRUCTION EQUIPMENT

DOUBLE-ACTING PILE HAMMERS AND EXTRACTORS	SINGLE-ACTING PILE HAMMERS PILE DRIVING RIGS
HOISTING EQUIPMENT	BLACKSMITHS' POWER HAMMERS
MARINE EQUIPMENT	SPECIAL MACHINERY

Completely Designed, Engineered and Manufactured or Manufactured from Your Design. *Full Information on Request.*

MK-233

McKiernan-Terry
CORPORATION
Manufacturing Engineers

13 Park Row
New York 7, N. Y.

Three Bridges over Caney River, near Bartlesville, Oklahoma

Continued from preceding page

16 Black traffic stripe—6"	63 lf	.20	.25
17 Black traffic stripe—24"	126 lf	.40	.50
Bridge # 3			
18 Substructure excavation common	325 cy	7.63	3.85
19 Class A concrete	171.2 cy	37.00	36.00
20 Class AA concrete	674 7 cy	37.70	46.00
21 Reinforcing steel	170,670 lb	.10	.077
22 Reinforced concrete piling	4,069 lf	6.15	5.00
23 Black traffic stripe—6"	421.33 lf	.20	.25
24 Black traffic stripe—24"	842.66 lf	.40	.50

Reinforced Concrete Bridge at Cherryvale, Kansas

OWNER: State Highway Commission of Kansas; R. C. Keeling, State Highway Engineer.

PROJECT: Construction of bridge to span railroad crossing at Cherryvale, Kansas. Bridge to be of continuous reinforced concrete slab spans, 32′—42′—46′—46′—42′—32′.

CONDITIONS: Access to job site is by railroad or U. S. Highway 160. All materials to be furnished by contractor. Contract time is 140 working days. Skilled wages range from $1.00 to $1.50 per hour; semi-skilled from $.80 to $1.00; and common labor, from $.60 to $.80.

BIDS: Five bids were received November 2, 1946, ranging from the contract low of $79,763.08 to $89,257.40.

LIST OF BIDDERS:

1. E. W. Geiger, Leavenworth, Kansas (contract)	$79,763.08
2. C. E. Maxwell & Son, Columbus, Kans.	80,397.70
3. F. H. Freeto, Pittsburg, Kans.	81,020.40
4. Inland Const. Co., Omaha, Nebraska	83,652.00
5. Carrothers Const. Co., Paola, Kans.	89,257.40

Item	Quantity	Unit Prices (1)	(2)	(3)
1 Class III excavation	1,045 cy	5.50	7.00	8.00
2 Class AA concrete	1,311.4 cy	37.00	37.00	36.00
3 Reinforcing steel	288,620 lb	.074	.07	.075
4 Structural steel	11,080 lb	.23	.25	.20
5 Bearing devices	3,175 lb	.50	.50	.50

Sea Wall, Hampton New Hampshire

OWNER: New Hampshire State Highway Department, Concord, N. H., Harold E. Langley, Bridge Engineer.

PROJECT: No. N. H. 527, construction of 3530-ft. steel and concrete sea wall in Town of Hampton, N. H.

CONDITIONS: Contractor to furnish all materials and to complete the job 150 working days after Mar. 1, 1946. Transportation facilities include B&M R. R. and Highway, Route 1A. Skilled labor rates range from equipment operators at $1.875, structural steel workers, $1.65, to journeymen carpenters at $1.20. Intermediate grade labor ranges from equipment operators at $1.50 to truck drivers at $0.90 with unskilled labor at $0.70 and $0.75.

BIDS: Twelve bids, opened January 24, 1946, ranged from $187,268.40 to $261,916.10. Bids were based on sand borrow for backfill with alternate bids taken on gravel borrow for backfill.

LIST OF BIDDERS:

		Alternate
1. Munroe-Langstroth, Inc., No. Attleboro, Mass. (contract)	$187,268.40	$188,522.48
2. Henley-Lundgren Co., Worcester 8, Mass.	229,482.15	230,742.15
3. A. D. Daddario, Boston, Mass.	235,400.61	235,400.61
4. New England Foundation Co., Inc., Boston, Mass.	242,681.90	242,681.90
5. Landers & Griffin, Inc., Portsmouth, N. H.	244,169.60	245,681.60
6. Marson Const. Co., Somerville, Mass.	251,740.99	251,740.99
7. Berke-Moore Co., Inc., Brookline, Mass.	254,473.49	259,513.49
8. Coleman Bros. Corp., Boston, Mass.	259,991.06	265,031.06
9. Harry R. Lee, Manchester, N. H.	260,641.07	264,421.07
10. Charter Oak Const. Co., Inc., Hartford, Conn.	261,708.33	264,228.33
11. Coughlan Construction Co. Inc., Boston, Mass.	261,916.10	263,579.30
12. Buck-MacDonald Co., Boston, Mass.	Informal	Informal

	Item	Quantity	Unit Prices (1)		(2)	
8.3	Unc. structure excavation	4,100 cu. yd.	$1.40	$5,740.00	$2.00	$8,200.00
11.2	Sand borrow for backfill	5,040 cu. yd.	.50	2,520.00	.60	3,024.00
14.1	Gravel borrow	259 cu. yd.	1.00	259.00	.90	233.10
14.1	Gravel borrow for backfill (alternate)	5,040 cu. yd.	.75	3,780.00	.85	4,284.00
19.1	Gravel surface course	671 cu. yd.	1.00	671.00	1.25	838.75
32.1	Concrete class A	1,068 cu. yd.	22.50	24,030.00	34.00	36,312.00
35	Reinforcing steel	61,827 lbs.	.08	4,946.16	.10	6,182.70
36.1	Structural steel	213,206 lbs.	.07	14,924.42	.10	21,320.60
37	Structural timber	141 mbm.	144.00	20,304.00	150.00	21,150.00
42.2	Steel sheet piling	765 tons	91.00	69,615.00	110.00	84,150.00
43.1	Treated timber bearing piles	8,160 lin. ft.	1.45	11,832.00	1.75	14,280.00
44	Bridge railing E	4,000 lin. ft.	5.10	20,400.00	4.50	18,000.00
49.4	Riprap D	648 cu. yd.	3.50	2,268.00	8.00	5,184.00
73	6" concrete sidewalk	3,104 sq. yd.	2.85	8,846.40	3.00	9,312.00
301	Stone chips	259 cu. yd.	3.50	906.50	5.00	1,295.00

Guide Walls, Landward Lock, Hastings, Minn.

OWNER: U. S. Engineers, Maj. H. J. Manger, District Engineer, St. Paul, Minn.

PROJECT: Guide Walls, Landward Lock, Lock and Dam No. 2, Mississippi River, Hastings, Minn., 920 and 500 ft. in length.

CONDITIONS: Owner will furnish 1, Poiree Trestles, including needles and parts for one poiree dam; 2, Bulkheads, steel for Tainter valve recesses, 2 sets; 3, paint, including vehicle, pigments and thinner. Completion time, 300 days after notice to proceed. Transportation by rail, C.M. & St. P.P. & C.B.Q.R.R., by highway, access road from Hastings, by water, Inland Waterway System. Wages range from skilled rates for bricklayers. $1.825; structural iron workers, $1.75; reinforcing ironworkers, $1.625; carpenters, $1.50; to unskilled laborers, $1.01. Power equipment operator's rates range from shovel and dragline operators at $1.85 to service truck drivers at $0.90.

BIDS: Four bids were received March 8, 1946 at St. Paul, Minn., ranging from the contract low of $637,755.50 to $1,180,480.00. The contract price is 14.5 percent above the government estimate of $556,608.30.

LIST OF BIDDERS:

1. United Constr. Co., Winona, Minn. (contract)	$637,755.50
2. Al Johnson Constr. Co., Minneapolis, Minn.	795,015.50
3. LaCrosse Dredging Corp., Chicago, Ill.	831,513.00
4. Spencer, White & Prentis, Inc., New York, N. Y.	1,180,480.00

	Item	Quantity	Government Estimate	Unit Prices (1)	(2)
1.	Cofferdam; upper guide wall	sum job	$40,000.00	$53,631.38	$188,655.00
2.	Cofferdam; lower guide wall	sum job	20,000.00	35,787.02	111,164.00
3.	Excavation	63,400 cu. yd.	0.30	0.66	0.60
4.	Backfill	15,300 cu. yd.	0.33	0.21	0.72
5.	Fill	7,300 cu. yd.	0.59	0.10	0.71
6.	Piling; round timber, vertical	50,700 lin. ft.	0.85	1.53	1.02
7.	Piling; round timber, batter	22,600 lin. ft.	0.90	1.66	1.02

Continued on page 193

* Why you can't always

* *The Demand for U S S Construction Products for jobs*

Guide Walls, Landward Lock Hasting, Minn.

Continued from page 189

8. Piling; steel sheet, cutoff wall....	9,820 sq. ft.	1.65	2.33	1.80
9. Piling; steel sheet, buffer cells...	5,250 sq. ft.	1.80	1.78	1.65
10. Protection stone; derrick.......	120 cu. yd.	12.00	5.00	32.00
10A Protection stone, riprap........	200 cu. yd.	7.00	3.50	13.75
10B. Protection stone; gravel........	85 cu. yd.	4.35	3.00	6.40
11. Gravel surfacing................	195 cu. yd.	4.35	3.00	2.60
12. Cement (for concrete)..........	18,220 bbl.	2.97	2.75	2.60
13. Concrete; class A...............	15 cu. yd.	33.00	75.00	169.50
13A. Concrete; class B..............	17,900 cu. yd.	16.00	14.71	13.85
14. Steel; structural...............	56,200 lb.	0.15	0.25	0.15
15. Steel; misc.....................	1,450 lb.	0.15	0.25	0.21
16. Steel; concr. reinf.............	5,800 lb.	0.10	0.10	0.08
17. Castings; steel.................	9,100 lb.	0.25	0.36	0.28
18. Castings; iron..................	5,000 lb.	0.35	0.27	0.39
19. Handrailing.....................	2,800 lin. ft.	2.50	2.75	2.42
20. Conduit; asbestos-cement, 3"....	1,380 lin. ft.	0.58	1.00	0.90
21. Conduit; asbestos-cement, 2"....	4,200 lin. ft.	0.43	0.80	0.74
22. Conduit; rigid metal, 3"........	50 lin. ft.	0.95	4.90	4.65
22A. Conduit; rigid metal, 2".......	130 lin. ft.	0.55	3.50	3.15
23. Install.; Poiree Dam & bulkheads	sum job	2,100.00	2,000.00	2,842.00
24. Stage record house, compl......	2 each	1,050.00	1,000.00	1,624.00
25 Fenders; complete assembly.....	sum job	1,000.00	800.00	730.00
26. Painting (except items 24 & 25)	sum job	6,000.00	1,000.00	2,098.00

Spillway and Embankment, Blue Mountain Dam, Arkansas

OWNER: U. S. Engineers, Little Rock, Arkansas.

PROJECT: Completion of concrete spillway and embankment, Blue Mountain Dam, on the Petit Jean River, near Waveland, Yell County, Arkansas.

CONDITIONS: All materials furnished by contractor. Transportation by Rock Island Railway and State Highway 10. Contract time, 360 calendar days. Common labor wages are $.65 per hour, semi-skilled $.75 to $1.00, and skilled, $1.25 to $1.50 per hour.

BIDS: Six bids were received March 5, 1946 at Little Rock, Arkansas, ranging from the contract low of $1,010,447.80 to $1,699,563.30.

The contract amount is 7 percent below the government estimate of $1,091,379.00.

LIST OF BIDDERS:

1. S. E. Evans Const. Co., Fort Smith, Ark. (contract)	$1,010,447.80
2. Ryan Const. Corp., Evansville, Ind.	1,246,444.50
3. M. R. Thomason, Contr., Montgomery, Ala.	1,247,237.50
4. Morrison-Knudsen Co. Inc., Little Rock, Ark.	1,309,048.00
5. R. B. Potashnick, Cape Girardeau, Mo.	1,328,281.00
6. Porter-DeWitt Const. Co., Poplar Bluff, Mo.	1,699,563.30

		Unit Prices		
Item	Quantity	(1)	(2)	(3)
1. Care and diversion of river....	sum job	$15,000.00	$60,000.00	$35,000.00
2. Stripping—embankment and dikes....................	13,000 cu. yd.	.20	.35	.40
3. Common excavation—general.	250,000 cu. yd.	.35	.45	.46
4. Common excavation—borrow areas....................	1,100,000 cu. yd.	.33	.36	.40
5. Rock excavation—general.....	23,000 cu. yd.	1.45	2.25	3.50
6. Rock excavation—trenches....	900 cu. yd.	15.00	14.30	15.00
7. Close line drilling............	9,500 sq. ft.	1.00	1.05	.85
8. Drilling—3" holes............	3,000 lin. ft.	.75	.88	.75
9. Core drilling—3" holes........	2,500 lin. ft.	3.00	3.30	2.70
10. Pressure grouting............	4,000 cu. ft.	2.00	2.20	.60
11. Foundation preparation......	710 squares (100 sq. ft.)	15.00	16.50	14.50
12. Protective treatment for shale.	700 squares (100 sq. ft.)	5.00	6.60	7.00
13. Bituminous cover for shale....	150 squares (100 sq. ft.)	5.00	6.60	7.00
14. Extension of settlement gages and seepage wells..........	280 lin. ft.	2.00	2.00	1.00
15. Backfill....................	9,500 cu. yd.	.70	1.50	.75
16. Selected and random impervious fill..................	630,000 cu. yd.	.10	.12	.12
17. Random pervious fill........	80,000 cu. yd.	.10	.12	.12
18. Rolling—each add'l pass—sheepsfoot roller..........	80,000 squares (100 sq. ft.)	.02	.02	.025
19. Rolling—each add'l pass—tractor..................	6,000 squares (100 sq. ft.)	.02	.04	.025
20. Sand—drain and backing.....	14,000 cu. yd.	2.75	3.48	3.10
21. Crushed rock or gravel.......	6,000 cu. yd.	2.00	3.85	3.50
22. Gravel surfacing—roadways...	3,000 cu. yd.	2.00	4.00	3.00
23. Dumped riprap..............	32,000 cu. yd.	1.50	2.25	2.40
24. Rock gutters................	300 cu. yd.	20.00	6.00	14.00
25. Reinforcing steel............	600,000 lb.	.07	.075	.07
26. Furnishing cement...........	14,000 bbl.	3.25	3.58	3.20
27. Concrete—spillway walls.....	4,900 cu. yd.	20.00	22.55	20.30
28. Concrete—weir, floor and cutoff wall..................	5,400 cu. yd.	10.70	14.00	11.50
29. Concrete—curb..............	150 cu. yd.	22.00	23.10	22.00
30. Furnish and install perf. concr. pipe, 6"..................	660 lin. ft.	.80	1.00	.95
31. Furnish and install perf. concr. pipe, 8"..................	900 lin. ft.	1.15	1.45	1.30
32. Install perf. concr. pipe, 18"...	468 lin. ft.	1.10	1.00	1.00
33. Furnish and install perf. concr. pipe, 18"..................	330 lin. ft.	3.00	3.50	3.25
34. Furnish and install perf. concr. pipe, 30"..................	500 lin. ft.	7.00	8.25	7.00
35. Concrete pipe, 24"...........	100 lin. ft.	3.50	4.70	4.25
36. Manholes...................	2 ea.	500.00	305.00	450.00
37. Copper water stops..........	5,600 lb.	.60	.66	.75
38. Setting anchors.............	290 ea.	2.00	1.95	2.00
39. Black steel pipe.............	1,000 lb.	.15	.17	.20
40. Highway posts..............	600 ea.	3.25	3.10	3.00
41. Highway guardrail..........	1,700 lin. ft.	1.40	1.50	1.50

Grenada Dam, Mississippi

OWNER: War Department, U. S. Engineers, Vicksburg, Mississippi.

PROJECT: Construction of a portion of the Grenada Dam embankment, the spillway, and appurtenant work on the Yalobusha River in Grenada County, approximately three miles northeast of Grenada, Mississippi. Work includes: a) site clearing for structures and borrow pits; b) construction of cofferdam in lifts not thicker than 2 ft. to a minimum elevation of 195.0 ft., drainage, and care of river during construction; c) excavation for stripping, miscellaneous grading, and for structures; d) construction of compacted earth fill dam, except for closure section gap, and gap at crossing of highway, railroad, and power line, but including upstream and downstream slope protection and slope drainage section; e) construction of spillway, including approach and outlet channels, weir, chute, and stilling basin and spillway bridge.

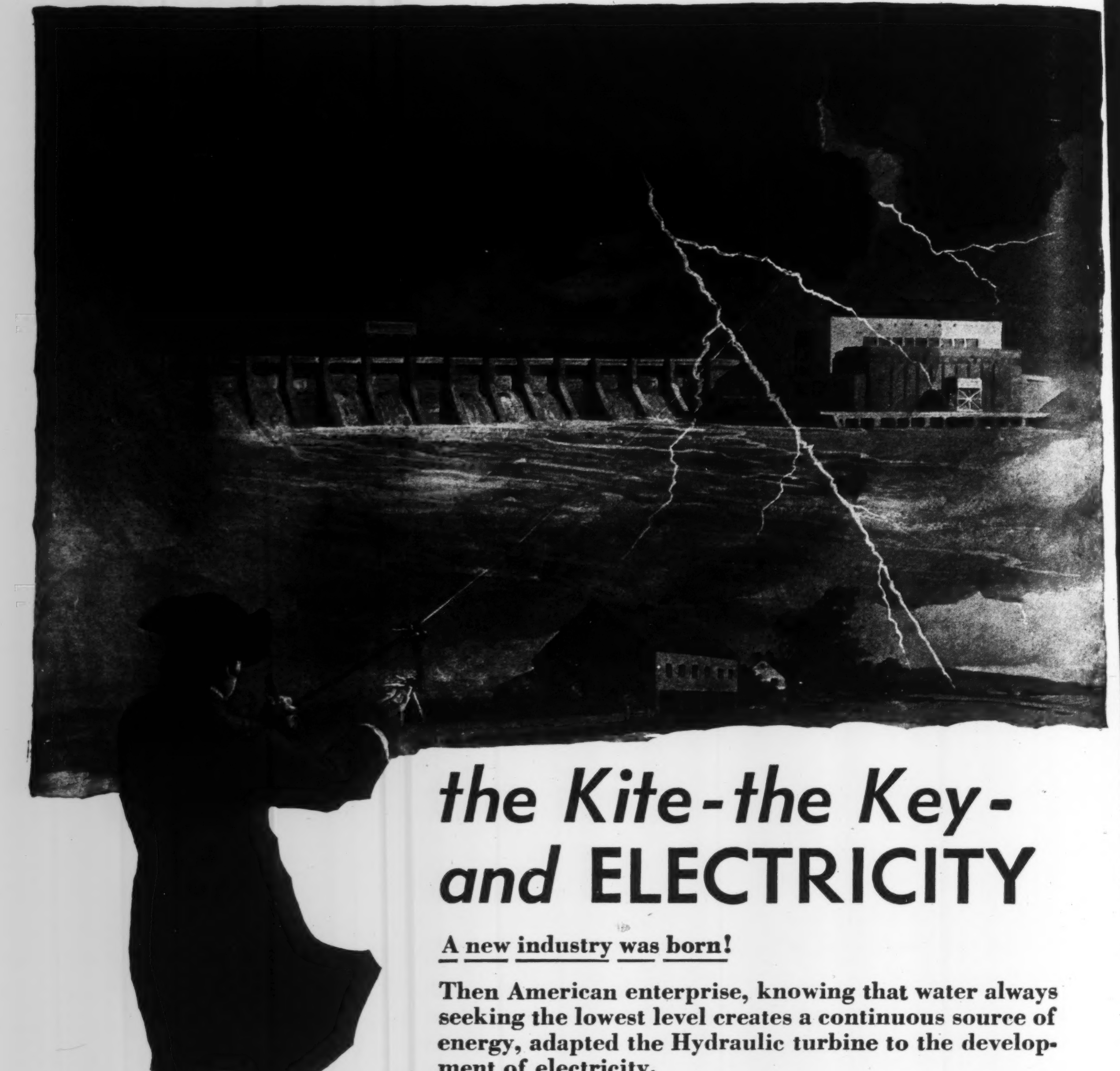
CONDITIONS: Contract time is 1,050 calendar days. Failure to complete contract within specified time will result in the assessment of liquidated damages of $500 per day. Wage rates specified are: structural iron workers, $1.625; crane operators, $1.625; reinforcing ironworkers, $1.50; bulldozer operators, $1.50; trenching machine operators, $1.50; truck drivers, over 3 tons, $0.75; truck drivers, 1½ to 3 tons, $0.70; and unskilled laborers, $0.60.

BIDS: Five bids were received January 10, 1947, ranging from the contract low of $9,154,033.30 to $15,441,503.95. The contract award of January 16, 1947 is 15 percent above the government estimate of $7,952,409.32.

LIST OF BIDDERS:

1. Edward E. Morgan Co., Inc., Jackson, Miss., Jones & Gillis, Inc., McComb, Miss., and Jones-Gillis Contracting Co., McComb, Miss. (contract)	$9,154,033.30
2. Pioneer Contracting Co., Inc., Memphis, Tenn. and Oman Const. Co., Nashville, Tenn.	9,395,750.00
3. Forcum-James Co., Dyersburg, Tenn., Hooper Const. Co., Jacksonville, Fla., and H. N. Rodgers & Sons Co., Memphis, Tenn.	9,469,042.50
4. Nello L. Teer Co., Durham, N. C.	9,729,751.75

Continued on next page



the Kite - the Key - and ELECTRICITY

A new industry was born!

Then American enterprise, knowing that water always seeking the lowest level creates a continuous source of energy, adapted the Hydraulic turbine to the development of electricity.

For nearly 75 years, we have been builders of hydraulic equipment with turbines alone totalling more than ten million horsepower capacity.

Our knowledge and experience thus gained are at your disposal when you place your problems in our hands. Why not write—today?

S. MORGAN SMITH COMPANY
YORK • PENNSYLVANIA, U. S. A.

POWER by SMITH

Grenada Dam, Mississippi

Continued from preceding page

5. Stebbing Engineering and Salvage Co., Washington, D. C.	15,441,503.95

Item	Quantity	Engineer's Estimate	Unit Prices (1)	(2)
1 Clearing	400 ac	$77.1945	$200.00	$200.00
2 Grubbing	244 ac	232.8457	250.00	200.00
3 Unwatering, drainage, and care of river during construction	lump sum	171,257.29	209,032.00	225,000.00
4 Stripping for embankment	205,000 cy	0.2292	.3275	.30
5 Excavation for drainage ditches and roads	22,000 cy	0.4512	.65	.40
6 Excavation for borrow	8,810,000 cy	0.3081	.3741	.37
7 Excavation for spillway	680,000 cy	0.3413	.4476	.55
8 Excavation for toe drainage system	40,000 cy	0.2870	.65	.75
9 Washing pervious fill material	247,000 cy	1.2373	.75	1.00
10 Compacted fill	7,713,000 cy	0.0737	.098	.10
11 Additional rolling for compaction	1,000,000 sq	0.0077	.0175	.03
12 Backfill, impervious	500 cy	2.1272	3.00	2.00
13 Backfill, pervious	48,000 cy	0.2503	.50	1.50
14 Backfill for toe drainage system	35,000 cy	1.0204	.78	1.00
15 Gravel "C"	2,300 cy	3.9449	6.00	4.50
16 Gravel "D"	1,300 cy	4.1740	6.00	4.50
17 Gravel "R"	112,700 cy	3.7700	3.25	3.50
18 Gravel "S"	,800 cy	5.7665	6.50	6.00
19 Gravel, ungraded	500 cy	3.5578	6.00	4.00
20 Selected stone	15 cy	7.3013	20.00	10.00
21 Additional harrowing	165,000 sq	0.0762	.075	.03
22 Clay seal	100 cy	3.6318	7.50	10.00
23 Gravel surface course	16,000 cy	3.0451	2.75	3.00
24 Dumped riprap	262,000 cy	7.0499	7.27	7.55
25 Hand placed riprap	12,000 cy	9.7062	8.66	10.50
26 Derrick stone	6,500 cy	9.9564	9.44	9.75
27 Grouting riprap paving	500 sy	3.1299	6.50	5.00
28 Topsoil	150,000 cy	0.5828	.70	.50
29 Spot sodding	370,000 sy	0.0933	.065	.07
30 Strip sodding	1,100 sy	0.1586	.25	.50
31 Solid sodding	81,000 sy	0.4102	.59	.80
32 Corrugated metal pipe, 12"	76 lf	2.3689	3.00	3.00
33 Corrugated metal pipe, 18"	630 lf	4.6524	4.75	4.25
34 Corrugated metal pipe, 24"	516 lf	7.5680	8.00	6.00
35 Corrugated metal pipe, 30"	323 lf	9.6060	10.00	10.00
36 Collector pipe, 48"	2,800 lf	14.4158	14.25	14.00
37 Collector pipe, 54"	2,000 lf	16.2655	18.00	18.00
38 Collector pipe, 60"	1,200 lf	21.1539	24.50	22.00
39 Sewer pipe, 12"	2,000 lf	2.7354	2.25	2.00
40 Sewer pipe, 15"	2,000 lf	3.4066	3.25	2.50
41 Sewer pipe, 18"	200 lf	4.4036	5.00	4.00
42 Culvert pipe, 24"	50 lf	6.4238	7.00	6.00
43 Vitrified clay pipe, 6"	400 lf	0.6897	1.00	1.50
44 Vitrified clay pipe, 6" perforated	1,150 lf	0.7879	1.25	1.60
45 Cast iron pipe, perforated	45,000 lb	0.0898	.25	.20
46 Wrought iron pipe	6,700 lb	0.2075	.35	.30
47 Seepage collector conduits, 12"	310 lf	1.2627	2.75	3.00
48 Seepage collector conduits, 18"	320 lf	2,3687	3.75	4.00
49 Seepage collector conduits, 21"	144 lf	3.2704	5.25	6.00
50 Relief wells	4,900 lf	13.8108	30.00	30.00
51 Plugging 6" wells	2 ea	275.3650	50.00	200.00
52 Drainage wells	850 lf	13.7773	30.00	30.00
53 Manholes for toe drainage system	16 ea	766.7088	700.00	600.00
54 Extra depth of manholes for toe drainage system	4 lf	57.6400	75.00	50.00
55 Gratings and manhole covers	12,300 lb	0.2540	.40	.15
56 Piling, steel sheet, type "A"	35,600 sf	2.1411	2.13	2.30
57 Piling, steel sheet, type "B"	7,785 sf	2.3320	2.13	2.30
58 Mastic cap for piling	750 cf	1.8451	1.65	2.00
59 Portland cement	36,600 bbl	3.1367	3.42	3.50
60 Concrete in spillway approach channel	1,625 cy	13.2666	17.85	16.00
61 Concrete in spillway weir, chute slab, & stilling basin floor	19,440 cy	11.3650	17.35	17.00
62 Concrete in spillway walls	4,780 cy	21.8430	27.30	25.00
63 Concrete in spillway bridge piers	205 cy	27.7040	47.25	50.00
64 Concrete in spillway bridge deck	220 cy	48.8695	63.00	50.00
65 Concrete in miscellaneous structures	350 cy	55.5585	57.75	55.00
66 Concrete in ditch paving	895 cy	15.4397	26.25	35.00
67 Steel reinforcement	1,568,000 lb	0.0643	.0795	.08
68 Copper water stop	7,000 lf	1.2187	2.10	2.50
69 Absorptive form lining	63,000 sf	0.1353	.16	.20
70 Structural steel in spillway bridge	234,400 lb	0.1527	.17	.16
71 Bridge handrail	440 lf	6.8513	14.20	10.00
72 Wall handrail	250 lf	6.7294	14.20	10.00
73 Metalwork, miscellaneous	21,200 lb	0.1384	.32	.40
74 Flap gate, 18"	1 ea	37.74	42.00	60.00
75 Copper inserts	200 lb	1.0617	1.56	1.00

Potholes Dam, Columbia Basin Project, Washington

OWNER: Bureau of Reclamation, Coulee Dam, Washington.

PROJECT: Construction of Potholes Dam on Crab Creek about 15 miles west of Warden, Washington. Project involves the construction of about 19,000 ft. of nearly continuous embankment, of varying height up to approximately 200 ft., across depressions in Crab Creek Basin; an outlet works in tunnel near the east end of the dam; a 500 ft. wide open channel spillway between sections of the embankment; and a roadway extending the full length of the crest of the dam. The dam will consist mainly of moistened and rolled embankments of clay, sand, and gravel, with outer sections of sluiced gravel fill. Upstream slopes of the embankments will be covered with a 3 ft. layer of rock riprap, and downstream slopes will have a 2 ft. rock surfacing. The outlet works will consist mainly of a concrete-lined tunnel about 700 ft. long of 7½ ft. diameter circular section, inlet and outlet structures, and a concrete-lined vertical shaft of 6 ft. diameter circular section providing access to a gate chamber in an enlarged section of the tunnel near the axis of the dam. Flow through the outlet tunnel will be controlled by a 4x4 ft. high-pressure slide gate in the plug concrete in the gate chamber. Discharge through a 22 in. diameter outlet pipe will be controlled by an 18 in. emergency gatevalve in the gate chamber and an 18 in. hollow-jet operating valve in the tunnel outlet structure. The roadway will be constructed between concrete curbs along the crests of the dam embankments and through adjoining rock cuts and will be surfaced with gravel or crushed rock.

CONDITIONS: The nearest railhead is 15 miles east, at Warden, Washington. Contractor must furnish cement and admixture for concrete, mortar, and grout; steel tunnel-liner plates for permanent tunnel supports; all gravel or rock spall for filling spaces back of steel tunnel-liner plates; all form materials; temporary supports; and all other materials not a part of the completed construction work. Contract time is 1400 calendar days. Wage rates are power shovel operators, $1.85 per hour; electricians, $1.75; cement finishers, $1.675; pipefitters, $1.65; rock crusher operators, $1.60; carpenters, $1.575; concrete mixer operators, $1.50; and common laborers, $1.05.

BIDS: Four bids were received August 15, 1946, ranging from the contract low of $9,359,011.00 to $11,168,479.00. Contract was awarded on October 24, 1946.

LIST OF BIDDERS:

1. C. F. Lytle Co., Sioux City, Ia.; Green Const. Co., Des Moines, Ia.; and Amis Const. Co., Oklahoma City, Okla. (contract)	$9,359,011.00
2. Bressi and Bevanda Constructors, Inc., Los Angeles, Calif.; A. Teichert & Son, Inc., Sacramento, Calif.; M. E. Keir Const. Co., Los Angeles, Calif.; and Guy F. Atkinson Co., So. San Francisco, Calif	9,584,677.00
3. Morrison-Knudsen, Inc., Seattle, Wash.; Peter Kiewitt Sons Co., Seattle, Wash.; Utah Const. Co., San Francisco, Calif.; S. Birch & Sons Const. Co., Great Falls, Mont.; Winston Bros. Co., Los Angeles, Calif.; McLaughlin, Inc., Los Angeles, Calif.; and C. & F. Trucking and Contracting Co., Butte, Mont.	10,448,000.00
4. J. A. Terteling & Sons, Inc., Boise, Idaho	11,168,479.00

Item	Quantity	Unit Prices (1)	(2)	(3)
1 Diversion and care of river during construction and unwatering foundations	lump sum	$40,000.00	$178,000.00	$225,661.00
2 Excavation, stripping borrow-pits	600,000 cy	0.32	0.22	0.25
3 Excavation, common, for spillway	380,000 cy	0.50	0.45	0.50
4 Excavation, rock, for spillway	480,000 cy	1.32	1.75	1.70
5 Excavation, common, in open cut for outlet works	1,400 cy	0.88	1.40	2.50
6 Excavation, rock, in open cut for outlet works	5,000 cy	2.65	3.20	2.50
7 Excavation, all classes, in tunnel and shaft	2,600 cy	16.90	42.00	35.00
8 Furnishing and installing steel tunnel-liner plates	10,000 lb	0.25	0.25	0.30

Continued on next page

Potholes Dam, Columbia Basin Project, Washington

Continued from preceding page

9 Excavation, common, for foundations of dam	535,000 cy	0.66	0.50	1.00
10 Excavation, rock, for foundations of dam	60,000 cy	2.65	3.00	3.25
11 Excavation, all classes, for grout caps in dam foundations	4,800 cy	16.90	19.00	20.00
12 Excavation, common, for roadway	2,000 cy	0.47	2.00	2.50
13 Excavation, rock, for roadway	2,300 cy	1.70	2.00	2.50
14 Excavation, common, in borrow-pit No. 1 and transportation to dam embankments	1,150,000 cy	0.448	0.44	0.40
15 Excavation, common, in borrow-pit No. 2 and transportation to dam embankments	3,500,000 cy	0.504	0.49	0.60
16 Excavation, common, in borrow-pit No. 3 and transportation to dam embankments	4,900,000 cy	0.591	0.45	0.60
17 Earthfill in embankments	5,000,000 cy	0.176	0.28	0.21
18 Sluiced sand and gravel fill in embankments	3,600,000 cy	0.147	0.20	0.16
19 Tamping or puddling earth fill	50,000 cy	2.28	3.00	2.50
20 Rock surfacing on downstream slopes of embankments	180,000 cy	0.50	0.38	0.40
21 Riprap on upstream slopes of embankments	400,000 cy	0.50	0.32	0.30
22 Road surfacing	10,000 cy	2.95	2.75	3.35
23 Drilling weepholes	250 lf	2.20	2.20	1.50
24 Core drilling 5½-inch diameter holes not more than 30 feet deep	1,000 lf	18.75	11.50	12.09
25 Drilling grout holes in stage between depths of 0 foot and 35 feet	15,000 lf	1.55	3.00	2.25
26 Drilling grout holes in stage between depths of 35 feet and 60 feet	10,000 lf	3.15	3 00	2.25
27 Drilling grout holes in stage between depths of 60 feet and 110 feet	2,500 lf	4.00	3.00	2.25
28 Drilling grout holes with percussion drills	15,000 lf	1.25	1.25	1.00
29 Placing grout pipe and fittings	22,000 lb	0.25	0.30	0.42
30 Pressure grouting	40,000 cf	1.90	2.00	2.00
31 Pressure grouting with packers	7,500 cf	2.50	2.50	2.15
32 Furnishing and handling cement	30,000 bbl	5.45	4.00	5.00
33 Concrete in grout caps	4,800 cy	12.75	15.00	14.00
34 Concrete in tunnel lining	900 cy	48.90	60.00	48.00
35 Concrete in trashrack structure and transition	75 cy	60.00	54.00	62.00
36 Concrete in shaft and gate chamber	260 cy	59.40	60.00	70.00
37 Concrete in tunnel outlet structure	100 cy	47.20	70.00	50.00
38 Concrete in gate chamber plug	60 cy	29.50	40.00	45.00
39 Concrete in spillway	750 cy	17.50	22.00	17.00
40 Concrete in curb walls	2,450 cy	39.20	54.00	35.00
41 Placing reinforcement bars	250,000 lb	0.05	0.05	0.06
42 Placing metal sealing strips	90 lb	1.70	1.50	2.05
43 Construction of valvehouse, except concrete	lump sum	280.00	600.00	1,000.00
44 Installing hollow-jet valve	1,600 lb	0.28	0.12	0.15
45 Installing high-pressure gate and conduit linings	45,000 lb	0.055	0.07	0.08
46 Installing high-pressure gate control piping	1,000 lb	0.42	0.60	0.30
47 Installing outlet pipe	24,000 lb	0.06	0.07	0.30
48 Installing trashrack metalwork	11,000 lb	0.04	0.12	0.10
49 Installing miscellaneous metalwork	9,200 lb	0.12	0.45	0.37

Allatoona Dam and Powerhouse, Georgia

OWNER: U. S. Engineer Office, Mobile 7, Ala., Col. Mark M. Boatner, Jr., Dist. Engr., John S. Webster, Res. Engr.

PROJECT: Construction of flood control dam on Etowah River, in Barton County, Georgia approximately 25 mi. upstream from Rome, 5 mi. east of Cartersville and 35 mi. northwest of Atlanta, Ga. A concrete structure, 184 ft. high, 400 ft. wide at base and 1,020 ft. long. It will regulate floods on the Etowah River, provide 66,000 kw of electric power and create a 20,000 acre lake.

CONDITIONS: The work to be performed includes the following principal features:

(a) Construction of access highway from U. S. Highway No. 41 to the dam site, construction of connecting road on right bank and temporary buildings including the Government field laboratory.

(b) Cofferdams for the control of the river including their construction and removal.

(c) Foundation preparation for dam and powerhouse including clearing, grubbing, excavating, drilling and grouting.

(d) Concrete masonry for the dam, stilling basin, spray walls, training walls, retaining walls, powerhouse and switchyard.

(e) The transportation from Cartersville, Georgia to the site of the work and installation of equipment supplied by the Government including turbines, governors, transformers, switching equipment, switchboards, head gates, Tainter gates, cranes and other equipment for the dam and powerhouse as specified and the transportation of the generators from Cartersville, Georgia to the site of the work.

(f) Furnishing and installation of the penstocks and all materials, equipment and machinery and auxiliary apparatus required to construct the dam and powerhouse complete and in good working order.

(g) The grading of hillsides to safe and permanent slopes. Work is to start within 30 days of notice to proceed. Complete concreting of dam (spillway and non-over flow section) to elev. 850 including temporary installation of penstock intake gate hoists, 865 calendar days ($250 per calendar day penalty); complete concreting of powerhouse including permanent installation of mechanical and electrical equipment except generators, for 1st 40,000 KVA, 888 calendar days ($250 per calendar day penalty); complete construction of powerhouse and installation of mechanical and electrical equipment except generators for second 40,000 KVA within 1,070 calendar days ($200 per calendar day penalty); complete entire project within 1170 calendar days ($100 per calendar day penalty).

Transportation facilities include railroad at Cartersville, 5 miles due west, a junction point of Nashville, Chattanooga and St. Louis R. R., Louisville and Nashville R. R. and Seaboard R. R. Cartersville is also on U. S. Highway No. 41 and U. S. No. 411, first class hard surfaced roads and secondary road No. 41 on north bank of Etowah River which passes through dam site but is submerged during high water. Access road is to be constructed as part of contract.

Minimum Wages range from a top for plumbers, steam fitters, bricklayers and stone masons of $1.75, structural iron workers and electricians, $1.65, carpenters, $1.375, power equipment operators, $1.60 to $0.90, to unskilled laborers, $0.65.

BIDS: Bids were taken April 16, 1946 on four alternates. Contract awarded, April 29, on alternate 2 to the low of five bidders at $13,282,088, 8.6 percent above the government estimate. The high bid was $17,806,585.39.

LIST OF BIDDERS: Alternate 2

1. National Constructors, Inc., Columbus, Ga., owned and operated by the Arundel Corp., Baltimore, Md., L. E. Dixon Co., Los Angeles, Calif., & Hardaway Contg. Co., Columbus, Ga. (Contract)	$13,282,088.00
2. Grannis, Thompson & Street Co., Charlotte, N. C. a joint venture of E. W. Grannis Co., Fayetteville, N. C., F. N. Thompson, Individual, Charlotte, N. C. and McDevitt & Street Co., Charlotte, N. C.	14,322,207.44
3. Walsh Constr. Co., New York, N. Y., Morrison-Knudsen Co., Inc., New York, N. Y., Bates & Rogers Constr. Corp., Chicago, Ill., B. Perini & Sons, Inc., Framingham, Mass., Henry J. Kaiser Co., Oakland, Calif., and Kaiser Co., Oakland, Calif., acting as joint contractors	14,599,902.00
4. Foley Bros., Inc., Pleasantville, N. Y., Johnson Drake & Piper, Inc., New York, N. Y., and Mason & Hanger Co., New York, N. Y.	15,930,824.20
5. J. A. Jones Constr. Co., Charlotte, N. C., and Wright Contrg. Co., Columbus, Ga., acting as joint contractors and co-adventurers	17,806,585.39
Government Estimate	12,232,136.74

Continued on next page

Allatoona Dam and Powerhouse, Ga.

Continued from preceding page

Item	Quantity	Unit Prices		
		Government Estimate	(1)	(2)
1. Cofferdams	570 lin. ft.	$789.00	$1,500.00	$946.46
2. Excavation, common	134,300 cu. yd.	.60	3.00	1.00
4. Excavation, rock	572,800 cu. yd.	2.55	3.00	3.00
5. Foundation preparation	200,000 sq. ft.	.21	1.00	.40
6. Press. grtg., consolidation, cmt	9,000 sack	1.75	3.50	2.00
7. Press. grtg., curtain, cmt	9,000 sack	1.75	3.50	2.00
8a. Drilling 1½" grt. holes, consol. grouting, 1st stage	2,500 lin. ft.	2.70	2.50	2.98
8b. Drilling 1½" grt. holes, consol. grouting, 2nd stage	4,100 lin. ft.	3.10	2.50	3.22
8c. Drilling 1½" grt. holes, consol. grouting, 3rd and succeeding stages	1,000 lin. ft.	3.96	2.50	3.39
9a. Drilling 1½" grt. holes, curt. grouting, 1st stage	5,000 lin. ft.	3.13	2.50	2.99
9b. Drilling 1½" grt. holes, curt. grouting, 2nd stage	6,500 lin. ft.	3.80	2.50	3.29
9c. Drilling 1½" grt. holes, curt. grouting, 3rd and succeeding stages	6,500 lin. ft.	4.85	2.50	3.39
10. Foundation drains, 5 inch	15,000 lin. ft.	5.25	6.00	9.58
11. 6" steel pipe stubs	560 lin. ft.	3.47	10.00	1.81
12. 6" C I screw caps	210 each	2.75	2.00	1.71
13. 3" black steel grout pipe	3,250 lin. ft.	.60	1.00	1.22
14. 3" C I screw caps	210 each	1.95	.50	1.01
15. Anchorage holes, 3-inch	5,000 lin. ft.	1.18	1.00	1.35
16. Random backfill	21,800 cu. yd.	.87	.60	1.50
17. Dumped rock backfill	48,250 cu. yd.	.93	.60	2.00
18. Hand-placed riprap	970 cu. yd.	3.75	10.00	12.00
19. Dumped riprap	4,480 cu. yd.	1.90	3.00	5.00
20. Crushed rock	3,060 cu. yd.	3.45	6.00	3.83
21. C I inlets, gratings, manhole frames and covers	39,250 lb.	.24	.14	.29
22. 6" concr. bell & spigot pipe	1,250 lin. ft.	1.50	1.00	1.07
23. 4" concr. bell & spigot pipe	1,600 lin. ft.	.80	1.00	.94
24a. Non-reinf. concr. pipe—12"	710 lin. ft.	1.40	1.70	1.76
24b. Concr. pipe, reinf.—18"	672 lin. ft.	2.45	3.20	3.33
24c. Concr. pipe, reinf.—24"	375 lin. ft.	4.40	5.00	5.09
24d. Concr. pipe, reinf.—36"	85 lin. ft.	7.00	8.00	12.85
24e. Concr. pipe, reinf.—54"	246 lin. ft.	16.00	18.00	20.00
24f. Concr. pipe, reinf.—60"	288 lin. ft.	19.00	20.00	23.00
25a. Standard culvert pipe—18"	300 lin. ft.	3.05	2.20	2.97
25b. Standard culvert pipe—21"	81 lin. ft.	3.60	2.50	4.09
25c. Standard culvert pipe—24"	282 lin. ft.	3.90	3.40	5.45
25d. Standard culvert pipe—30"	340 lin. ft.	5.10	4.40	8.28
25e. Standard culvert pipe—36"	457 lin. ft.	6.85	6.50	10.00
25f. Standard culvert pipe—48"	78 lin. ft.	8.85	8.50	15.69
26. 24" ½-rd. vit. clay dr. pipe	1,450 lin. ft.	3.50	4.00	5.21
27. Press. deposited cmt. mortar finish	1,600 sq. ft.	.63	1.00	1.54
28. Alter. #1, cmt., Portland in concr.	500,000 bbl.	2.80	2.30	3.30
29. Alter. #2, cmt., Portland in concr.	400,000 bbl.	2.80	2.30	3.30
30. Alter. #2, cmt., slag in concr	100,000 bbl.	2.50	2.20	3.25
31. Concrete, class A	26,600 cu. yd.	36.00	28.00	43.58
32. Concrete, class B	82,250 cu. yd.	15.50	13.75	14.42
33. Concrete, class C	408,600 cu. yd.	7.75	9.75	9.72
34. Reinforcing steel	5,411,800 lb.	.08	.08	.075
35. Wire mesh reinforcing	9,500 lb.	.14	.13	.15
36. Copper stops	6,000 lb.	.32	1.00	.97
37. Spec. bitum. filler, type C	130,000 lb.	.13	.12	.15
38. 24" C I bell & spigot pipe, cl. B.	17,000 lb.	.13	.08	.10
39. 24" C I pipe fittings, cl. B	7,100 lb.	.19	.16	.19
40. 18" C I bell & spigot pipe, cl. B.	1,800 lb.	.13	.08	.10
41. 18" C I pipe fittings, cl. B	530 lb.	.23	.16	.15
42. Grills over air vent pipes	Sum Job	156.00	700.00	180.00
43. 6" round precast porous concrete drain pipe	10,300 lin. ft.	1.27	1.20	.91
44. 3" & 4" C I bell & spigot drain pipe.	15,900 lb.	.12	.12	.14
45. Pipe hand rail, dam gallery	775 lin. ft. of pipe	.50	1.00	1.73
46. C I brackets for pipe rail in dam gallery	173 each	2.05	1.00	1.02
47. Pipe railing	4,500 lin. ft. of pipe	.80	3.90	1.73
48. 48" C I bell & spigot sluiceway pipe	220,000 lb.	.41	.055	.06
49. 48" C I flanged pipe, cl. B	43,300 lb.	.17	.10	.16
50. 48" by 72" c i sluiceway pipe bellmouth	19,500 lb.	.31	.23	.27
51. 48" pipe couplings	4 each	342.00	230.00	345.50
52. 48" C I pipe fittings	22,000 lb.	.24	.15	.17
53. 48" motor oper. non-rising stem, double disc, brass-trimmed, gate valves	2 each	6,585.00	9,000.00	10,982.50
54. 48" motor oper. free discharge valves	2 each	17,070.00	14,500.00	17,168.50
55. 8" C I pipe	10,430 lb.	.10	.07	.15
58. 1½" brass pipe & fittings	30 lb.	1.43	2.50	8.39
61. Trashrack rake, hoist & car	Sum Job	47,350.00	13,000.00	14,407.00
62. 3" extra heavy steel pipe and fittings	600 lb.	.22	.17	.20
63. 3" brass gate valve	4 each	75.00	30.00	37.00
64. Passenger elevator in dam	Sum Job	29,800.00	18,000.00	32,338.00
65. Galvanized iron gratings	140 sq. ft.	2.10	2.00	3.78
66. Hollow metal and fire protection doors in dam	Sum Job	500.00	1,200.00	1,165.00
67. Picket gates, dam	Sum Job	690.00	1,000.00	1,275.00
68. Anchor. bracket, gantry crane	Sum Job	3,600.00	2,500.00	2.882.00
69. 3 main unit penstocks and 1 service unit penstock	Sum Job	343,400.00	270,000.00	346,984.00
70. Bulkheads, penstock No. 3	2 each	1,340.00	3,000.00	1,654.00
71. Rails, gantry crane track and head gate hoist tracks	194,000 lb.	.11	.16	.06
72. Trashrack steel	692,000 lb.	.14	.12	.20
73. Miscellaneous steel in dam	105,600 lb.	.21	.30	.28
74. Separate floor finish in powerhouse	Sum Job	1,550.00	6,000.00	2,088.00
75. Struct. steel, powerhouse	441,000 lb.	.14	.09	.11
76. Switchyard steel structure	308,000 lb.	.18	.14	.21
77. Misc. steel, powerhouse	48,000 lb.	.25	.33	.28
78. Wire grille partitions in powerhouse	993 sq. ft.	1.30	1.50	2.25
79. C I spiral stairs, powerhouse	94.5 ft. of height	26.00	50.00	44.79
80. C I safety trds, powerhouse	248 lin. ft.	1.23	4.00	3.35
81. C I thresholds, powerhouse	106 lin. ft.	1.90	4.00	1.87
82. Misc. C I, powerhouse	12,100 lb.	.25	.20	.57
83a. Terra cotta furring and partitions in powerhouse—12"	366 sq. ft.	.80	.80	.69
83b. Same, 8"	336 sq. ft.	.50	.65	.56
83c. Same, 6"	8,900 sq. ft.	.38	.55	.43
83d. Same, 4"	5,500 sq. ft.	.30	.50	.31
83e. Same, 3"	822 sq. ft.	.29	.45	.30
84. Metal lath in powerhouse	660 sq. yd.	.50	2.00	2.46
85. Cmt. plaster, powerhouse	815 sq. yd.	1.00	1.10	2.47
86a. Gypsum plaster, powerhouse—two coat work	600 sq. yd.	1.14	1.90	1.76
86b. Gypsum plaster, powerhouse—three coat work	1,074 sq. yd.	1.50	2.00	2.12
87a. Tile work in powerhouse—quarry tile flooring	14,100 sq. ft.	1.88	.85	.90
87b. Tile work in powerhouse—quarry tile base separate	300 lin. ft.	1.40	.85	.72
87c. Tile work in powerhouse—quarry tile wainscot, including base	3,440 sq. ft.	1.94	1.00	2.39
87d. Tile work in powerhouse—quarry tile stair treads 4 risers	210 lin. ft.	2.12	2.00	4.18
87e. Tile work in powerhouse—quarry tile thresholds	100 lin. ft.	1.50	1.65	2.77
87f. Tile work in powerhouse—glazed terro cotta wall ashlar	5,200 sq. ft.	2.30	3.00	3.36
88. Suspend. ceiling, powerhouse	630 sq. yd.	5.20	5.00	4.15
89. Caulking in powerhouse	Sum Job	240.00	300.00	51.00
90. Steel lockers in powerhouse	30 each	23.00	25.00	24.83
91a. Glass in powerhouse—plate	195 sq. ft.	2.40	1.45	1.31
91b. Glass in powerhouse—clear	49 sq. ft.	.70	.75	.63
91c. Glass in powerhouse—Florentine.	330 sq. ft.	.75	.75	.60
91d. Glass in powerhouse—block	3,625 sq. ft.	2.20	1.00	2.80
92a. Toilets and shower bath stalls, powerhouse, marble 1½"	220 sq. ft.	4.20	8.00	4.84
92b. Same, marble ⅞" thick	126 sq. ft.	3.50	7.50	3.47
92c. Same—wood doors for toilets	11 each	37.00	45.00	49.09
93. Wood office partitions in powerhouse	75 lin. ft.	15.00	38.00	29.45
94. Linoleum in powerhouse	328 sq. yd.	3.75	4.00	3.61
95a. Cover plates for expansion joints in powerhouse and switchyard —steel plate	6,853 lb.	.47	.20	.28
95b. Same—pressed steel	220 lb.	.75	.50	.30
96. Aluminum rail'g, powerhouse	450 lin. ft.	5.80	8.00	13.90
97. Sheet brass	125 lb.	1.10	2.00	.92
98. Tile flue	Sum Job	850.00	700.00	554.00
99. Gypsum roof slab over generator room	Sum Job	10,680.00	7,000.00	12,206.00
100. Asphalt built-up roofing on powerhouse and on stair housing on dam	2,750 sq. yd.	1.80	1.75	1.96
101. Copper flashing, powerhouse	2,450 lb.	1.05	.60	.98
102. Hollow metal frames and trim in powerhouse	Sum Job	2,740.00	2,500.00	3,254.00
103. Wood and main entrance doors of powerhouse	Sum Job	4,100.00	6,000.00	6,441.00
104. Automatic fire doors in powerhouse	3 each	135.00	130.00	111.33
105. Steel rolling doors in powerhouse.	2 each	1,780.00	1,600.00	2,069.00
106. Finish hardware, powerhouse	Sum Job	1,900.00	2,600.00	2,190.00
107. Standard gauge railroad track, powerhouse & switchyard	404 lin. ft.	6.60	10.00	17.69
108. Stop-log gates & guides	Sum Job	25,780.00	25,000.00	30,139.00
109. Stop-log hoist and track	Sum Job	8,700.00	20,000.00	8,320.00
110. Passenger elevator, in ph	Sum Job	21,875.00	15,000.00	23,209.00
111. Rails for powerhouse crane	37,300 lb.	.12	.07	.07
112. Painting in powerhouse	Sum Job	7,800.00	2,500.00	7,014.00
113. Unwatering system	Sum Job	12,750.00	20,000.00	10,360.00
114. Penstock equalizing system	Sum Job	30,940.00	40,000.00	32 355.00
115. Raw water system	Sum Job	28,550.00	35,000.00	35,992.00
116. Sump pump piping	Sum Job	3,515.00	6,000.00	3,482.00
117. Piezometer piping	Sum Job	7,920.00	12,000.00	8,348.00
118. Insulating oil purifying equip. and distribution piping	Sum Job	16,180.00	20,000.00	23,860.00
119. Governor and lubricating oil purifying equip. and distribution piping	Sum Job	7,650.00	10,000.00	9,969.00
120. Air compressors and distribution piping	Sum Job	4,700.00	5,000.00	6,840.00
121. Sump pumps & oil drain pump	Sum Job	8,470.00	10,000.00	8,729.00
122. Water treatment plant	Sum Job	19,400.00	15,000.00	14,404.00
123. Co_2 fire protection system	Sum Job	24,080.00	15,000.00	26,268.00
124. Transformer fire protect. sys	Sum Job	32,170.00	25,000.00	28,239.00
125 Oil storage tanks	Sum Job	13,260.00	25,000.00	10,367.00
126. Gas.-elec. generator set & acces.	Sum Job	9,050.00	10,000.00	7,270.00
127. Fire extinguisher	Sum Job	30.00	30.00	25.00
128. Heating system	Sum Job	23,900.00	30,000.00	27,302.00
129. Vent. and air cond. sys	Sum Job	66 300.00	75,000.00	62,540.00
130. Domestic water sup. system	Sum Job	3,875.00	10,080.00	6,548.00
131. Powerhouse drainage system	Sum Job	29,360.00	30,000.00	18,372.00
132. Ph fire protect. system	Sum Job	2,300.00	3,000.00	2,661.00
133. Sanitary plumbing	Sum Job	6,460.00	7,000.00	22,450.00
134. Imhoff tank	Sum Job	1,985.00	1,500.00	5,481.00
135. Steel conduit	218,000 lb.	.48	.35	.52
136. Transite conduit	100 ft.	1.75	5.00	5.47
137. Cable trays & term. rm. struct.	Sum Job	36,270.00	55,000.00	55,698.00
138. Insulated wires and cables	72,000 lb.	2.09	.90	1.30
139. 13,800 volt connections and equip.	Sum Job	76,600.00	135,000.00	122,344.00
140. Motor control and misc. service equip	Sum Job	24,775.00	30,000.00	49,266.00
141. Light fixtures & cabinets	Sum Job	26,600.00	40,000.00	30,518.00
142. Receptacles and plugs	Sum Job	4,410.00	6,000.00	5,337.00
143. Telephone equipment	Sum Job	8,290.00	15,000.00	6,569.00
144. Copper busses & connections	Sum Job	12 460.00	25,000.00	13,001.00
145. Grounding system	24,400 lb.	1.03	1.00	3.22
146. U. S. engr lab. bldg compl. with util. & in operating order and outside util. to office bldg	Sum Job	5,960.00	10,000.00	6,322.00

Continued on page 201

WHY A TON OF PURE WATER

CAST IRON
WEIMER PURSELL

HOW can a ton of water (240 gallons) be collected, processed and delivered to the faucet, for less than a dime?

Because public water supply is a big industry—seven times bigger in tonnage volume than the combined product of all other industries—delivering an indispensable product without a substitute. This is part of the reason but not the big part.

More than half of the capital investment of public water supply systems in this country is in distribution mains, ordinarily financed by bond issues with an average term of 30 years.

If these mains had to be dug up and replaced every 30 years—either because of failure or ruinous maintenance costs—water could *not* be sold for anything like a dime a ton. Bond issues and bond interest, high replacement and maintenance costs, would go on forever, making it impossible to deliver water at low cost.

But over 95% of all the water distribution mains in this country are cast iron mains with a known efficient life of at least 4 times the average term of an issue of water works bonds.

Therefore, cast iron pipe represents the major part of the capital investment in

CAST IRON PIPE

Allatoona Dam and Powerhouse, Ga.

Continued from page 197

147. Flagpole	Sum Job	650.00	500.00	690.00
148. Common excavation, highway	183,240 cu. yd	.45	.35	.60
149. Rock excavation, highway	34,500 cu. yd.	3.25	1.25	1.50
150. Overhaul, highway	2,472,000 sta. yd.	.005	.005	.01
151. Base course: cr. stone, hwy	75,425 sq. yd.	1.20	1.00	1.67
152. Bituminous primer, highway	22,700 gal.	.16	.20	.20
153. Asphaltic concrete, highway	7,250 ton	7.20	7.50	10.52
154. Guard rail, highway	16,500 lin. ft.	2.25	2.00	1.79
155. Dam raw water system	Sum Job	1,100.00	1,000.00	6,295.00
156. Condensation prevent. coatg	400 gal.	4.70	6.00	9.50
157. Bitum. tack coat, highway	7,200 gal.	.15	.11	.20
Government Furnished Equipment To Be Transported and Installed				
G-1. Headgate frames and guides	666,000 lb.	.056	.04	.13
G-2. 7 headgates & 5 hoists	Sum Job	21,560.00	10,000.00	10,097.00
G-3. 9 radial gates includ. embedded steel, guides and machy, and 1 bulkhead gate	Sum Job	75,700.00	45,000.00	100,489.00
G-4. 2 regulating gates, including embedded steel, guides and machy, and 1 bulkhead gate.	Sum Job	14,870.00	6,000.00	20,583.00
G-5. Gantry crane	1 each	14,930.00	4,500.00	17,018.00
G-6. Powerhouse crane	1 each	33,400.00	11,000.00	24,141.00
G-7. 50,000 hp. turbine & governors.	2 each	26,760.00	55,000.00	64,374.00
G-8. 2,900 hp. turbine & governor	1 each	2,575.00	4,500.00	5,477.00
G-9. Hydraulic gauge boards	Sum Job	1,540.00	3,000.00	2,463.00
G-10. A. Bench, instrument, relay & aux. contr. switchboards with water level transmitters & master clock with load & frequency contr. equip	Sum Job	13,500.00	4,200.00	4,585.00
G-10. B. Bench, instrument, relay & aux. contr. switchboards with water level transmitters & master clock without load & frequency control equip	Sum Job	12,450.00	4,000.00	4,448.00
G-11. Excitation cubicles (payment incl. with items G-20 & G-21)				
G-12. Neutral circuit breakers and neutral reactors	Sum Job	2,450.00	890.00	4,756.00
G-13. 2,300 volt station service switchboard and service unit surge protection	Sum Job	3,280.00	1,900.00	1,609.00
G-14. 460 volt station service switchboard and transformers	Sum Job	1,600.00	2,300.00	3,388.00
G-15. 208–120 volt lighting distribution switchboard and lighting transformers in ph. & dam.	Sum Job	515.00	1,500.00	1,540.00
G-16. Battery, charging equip. & D.C. distribution and battery control board	Sum Job	1,100.00	1,100.00	1,602.00
G-17. Main power transformers	Sum Job	16,200.00	7,500.00	48,034.00
G-18. Service transformers	Sum Job	1,420.00	975.00	2,053.00
G-19. Switchyard switching, metering, and protect. equip	Sum Job	15,050.00	11,500.00	49,540.00
Government Furnished Equipment To Be Transported				
G-20. Main unit generators	2 each	12,200.00	8,600.00	3,696.50
G-21. Service unit generator	1 each	825.00	2,000.00	214.00

Core Drilling at Hogan Dam, near Valley Springs, California

OWNER: War Department, U. S. Engineer Office, Sacramento, Calif.

PROJECT: Drilling approximately 800 lin. ft. of "NX" core, depth ranging from 100 to 150 ft. in foundations and from 15 to 35 ft. in concrete, and drilling approximately 40 lin. ft. of 6 in. core in concrete about 10 ft. deep.

CONDITIONS: Job site approximately 3½ miles by road from Valley Springs, Calif. Completion date, 45 calendar days from notice to proceed. Prevailing wages, $1.50 for skilled labor, $1.25 for semi-skilled, and $1.00 for common labor.

BIDS: Four bids were received April 22, 1946 at Sacramento, Calif., ranging from the contract low of $6,505.50 to $9,991.25. The contract amount is 4 percent below the Engineer's Estimate of $6,785.

LIST OF BIDDERS:

1. Frank L. Howard Engrg. Co., Los Angeles	$6,505.50
2. Mitchell Diamond Drill Co., San Francisco	6,557.50
3. Processed Diamond Bit & Tool Co., San Francisco	7,268.75
4. Daniel C. Longtin, San Francisco	9,991.25

Item	Quantity	Unit Prices (1)	(2)	(3)
1. Mobilization and demobilization	1 job	$160.00	$280.00	$250.00
2. Overburden drilling	50 lin. ft.	5.50	6.00	5.00
3. Drilling NX core in concrete	100 lin. ft.	6.50	6.35	5.00
4. Drilling NX core in rock	700 lin. ft.	5.50	5.50	6.50
5. Drilling 6-in. core in concrete	40 lin. ft.	12.00	6.50	12.50
6. Casing or pipe left in hole	75 lin. ft.	1.50	1.50	1.65
7. Reaming	50 lin. ft.	3.50	2.50	2.00
8. Cementing and drilling out cement	150 lin. ft.	2.00	2.50	2.50
9. Pressure testing	70 hr.	8.00	5.00	5.00
10. Drill set-up for NX holes in concrete	2 each	15.00	40.00	40.00
11. Drill set-up for NX holes in rock	7 each	15.00	40.00	40.00
12. Drill set-up for 6-in. diameter holes in concrete	4 each	2.00	40.00	40.00

Floodwall, New Orleans, Louisiana

OWNER: U. S. Engineer Office, New Orleans; Louisiana.

PROJECT: Construction of (1) concrete floodwall approximately 8 ft. high and 12 in. in thickness with steel and timber bearing piles and steel sheet pile cut-off wall; (2) pipe and concrete box interceptor storm sewer and (3) subgrade for railroad spur relocation. Project is to be constructed at Morgan City, St. Mary Parish, Louisana.

CONDITIONS: Incidental work consists of providing for underground utilities crossing the wall, concrete street paving and sidewalks, shell paving, connecting existing lateral sewers to the interceptor storm sewer, and installing light standards and sidewalks, shell paving, connecting existing lateral storm sewers to the interceptor storm sewer, and installing light standards and wiring. All materials to be furnished by contractor. Access to job site is available by both railroad and highway. Contract time is 270 calendar days. Prevailing wage rate in New Orleans is $1.625 per hour for structural iron workers, $1.55 for hoisting engineers, $1.375 for carpenters and $.75 for common labor.

BIDS: Five bids were received December 16, 1946, ranging from the contract low of $267,636.82 to $388,919.20. The low bid is 19 percent higher than the government estimate of $225,185.20.

LIST OF BIDDERS:

1. Keller Construction Co., New Orleans, La	$267,636.82
2. Forcum-James Co. Inc., Baton Rouge, La	293,830.10
3. W. R. Aldrich and Co., Baton Rouge, La	312,843.03
4. Hendry Corporation, Rattlesnake, Fla.	341,463.44
5. Kansas City Bridge Co., Kansas City, Mo.	388,919.20

	Item	Quantity	Unit Prices Government Estimate	(1)	(2)
1	Excavation for railroad relocation	[illegible]75 cy	$0.68	$1.00	$1.00
2	Excavation, general	10,000 cy	0.77	1.00	1.00
3	Backfill	7,800 cy	1.20	1.00	1.00
4	Shell fill	20 cy	11.91	3.95	5.00
5	Treated timber piling	16,620 lf	1.70	1.80	2.00
6	Steel bearing piling	210 lf	6.02	4.00	4.00
7	Steel sheet piling	38,406 sf	1.26	1.75	1.85
8	Reinforced concrete sewer pipe, 24"	466 lf	4.50	6.78	6.00
9	Reinforced concrete sewer pipe, 27"	427 lf	6.52	7.87	7.50
10	Storm sewer lateral connections	12 ea	44.94	20.00	50.00
11	Brass water pipe, ¾"	41 lf	2.03	1.00	2.00
12	Steel pipe, 2"	8 lf	2.90	1.00	1.50
13	Relocating 6" water main	Lump sum	471.81	250.00	500.00
14	Installing 4" pipe for future use	34 lf	3.02	1.37	2.00
15	Installing 6" pipe for future use	34 lf	3.02	1.37	2.50
16	Installing 8" pipe for future use	24.5 lf	3.97	2.62	3.00
17	Steel pipe sleeves or existing installations.	21 ea	95.45	25.00	25.00
18	Installing steel pipe sleeves or future installations	7 ea	35.80	15.00	20.00
19	Concrete in floodwall	1,500 cy	29.80	32.00	36.00
20	Concrete in storm sewer	650 cy	32.68	40.00	50.00
21	Concrete in pavement and sidewalk	3,500 sy	3.27	4.00	4.00
22	Cement	4,100 bbl	3.13	3.50	3.25
23	Steel reinforcement	240,000 lb	0.082	0.1050	0.10
24	Copper water stops	500 lb	1.12	1.00	1.25
25	Miscellaneous metal	27,400 lb	0.23	0.30	0.35
26	Electrical work	Lump sum	4,200.00	7,000.00	14,000.000

Never Forget!

A TRUCK THAT FITS THE JOB SAVES MONEY!

THAT'S RIGHT . . . for a truck that will save you money, get a "*Job-Rated*" truck.

A "*Job-Rated*" truck is a truck that FITS your job—a truck in which every unit is engineered and "*Job-Rated*" for the size and kind of loads you carry.

Such a truck is more dependable. It will last longer. It will save money on operating and upkeep costs.

Your "*Job-Rated*" truck will be the right one of 175 Dodge chassis models to give you maximum economy and dependability. It will have the right one of 7 different engines.

It will have the right one of 5 clutches, 4 transmissions, 18 rear axles—the right units throughout to fit YOUR job . . . save YOU money!

To get such a truck, see your Dodge dealer . . because *only* Dodge builds "*Job-Rated*" trucks!

DODGE DIVISION OF CHRYSLER CORPORATION

SMITH-NUPPNAU CO.
Telephone 98
VALPARAISO

DODGE

ONLY DODGE BUILDS "*Job-Rated*" TRUCKS

Fit the Job . . . Last Longer!

Platform Extensions to IRT Subway Stations, New York City

OWNER: Board of Transportation, City of New York.

PROJECT: Construction of platform extensions at the 103 St., 110 St., 116 St., 137 St., 145 St., 157 St., 168 St., 181 St., 191 St., and Dyckman St. Stations of the Broadway-Seventh Ave. Branch of the New York City Transit System, IRT Division, in the Borough of Manhattan. The work will be performed by trench excavation from the street surface except at the 168 St., 181 St., 191 St., and Dyckman St. Stations. Shafts will be provided at the 168 St. and 181 St. Stations. The Dyckman St. Station is located adjacent to the portal to the tunnel.

CONDITIONS: It will be necessary to take up and relay sidewalk and roadway pavement; to protect and support all structures, water mains, gas pipes, poles, and wires; to remove and reconstruct portions of the existing subway line; and to do station finish work. Contract is scheduled for completion 18 months from date of award. Some of the skilled labor wage rates stipulated are: structural ironworkers, $2.25 per hr., hoisting engine operating engineers, $2.25; blasters, $2.125; carpenters, $2.10; cement masons, $2.1[illegible]; electricians, $2.00; composition roofers and waterproofers, $1.85; and curb setters, $1.75; semi-skilled labor rates are $1.875 for maintenance engineers; cement and concrete workers, $1.40; and asphalt workers, $1.27; unskilled labor rates are concrete rakers, $1.25; grade and concrete workers and laborers, $1.15; and tunnel laborers, $.95.

BIDS: Only two bids were received September 19, 1946, the contract low of $3,639,515.00 and the next bid of $3,782,372.50.

LIST OF BIDDERS:

1. Spencer, White & Prentis, Inc., New York, N. Y. (contract	$3,639,515.00
2. National Structures Corp., New York, N. Y.	3,782,372.50

	Item	Quantity	Unit Prices	
			(1)	(2)
1	Earth excavation	6,100 cy	25.00	65.00
5	Rock excavation (trench)	5,400 cy	45.00	65.00
10	Rock excavation (tunnel)	4,000 cy	90.00	180.00
15	Decking	2,000 sy	40.00	30.00
17(a)	Tunnel timbering	125 Mbm	150.00	150.00
17(b)	Steel supports	200 ton	150.00	150.00
20	Concrete masonry	4,000 cy	60.00	70.00
21	Protective concrete masonry	650 cy	60.00	70.00
22	Finished surface on concrete	29,000 sf	.30	.15
30	Removal of masonry	2,750 cy	40.00	65.00
34	Grout of portland cement	1,000 bbl	18.00	20.00
40	Steel	750 ton	400.00	400.00
45	Steel reinforcement bars	45 ton	280.00	300.00
47(a)	Cutting of steel	6,000 si	2.00	1.00
47(b)	Drilling holes	17,500 ea	4.00	1.50
47(c)	Removal of rivets	2,850 ea	2.00	1.50
47(f)	Plugging holes	100 ea	3.00	5.00
50	Iron castings	4 ton	650.00	300.00
55(a)	Wire mesh beam wrapping	2,700 lb	1.00	1.00
60(c)	Waterproofing—3-ply	4,500 sy	5.50	3.00
60(d)	Waterproofing—4-ply	2,000 sy	6.50	3.50
61	Waterproofing—dry-ply	200 sy	1.25	1.00
63	Asphalt mastic	500 cf	7.00	4.00
64	Dampproofing concr. surf	250 sy	3.00	.70
80	Vit. clay tunnel ducts	19,200 dt f	.60	.50
82	Vit. R. R. ducts	4,500 dt f	2.00	1.00
125(a)	Roadway restored—(asphalt)	1,850 sy	15.00	7.00
125(g)	Roadway restored—(granite)	60 sy	24.00	15.00
126	Sidewalk restored	100 sy	6.50	7.00
128(c)	New curb (5" bluestone)	30 lf	10.00	6.00
128(g)	New curb (6" granite)	30 lf	12.00	10.00
129(ab)	Resetting old curb (5" bluestone)	190 lf	7.00	4.00
129(ag)	Resetting old curb (6" granite)	160 lf	8.00	5.00
132(a)	Temp. roadway pavement	1,900 sy	7.00	4.00
151	Maint. etc. B'way-7th Ave. Subway	lump sum	528,000.00	349,000.00
160(t)	Laying low-press. water pipe for 20"	50 lf	24.00	15.00
160(aj)	Laying low-press. water pipe for 36"	50 lf	30.00	20.00
166	New low-press. water & gas c.i. stright pipe	11 ton	200.00	110.00
167	New low-press. water & gas c.i. specials	7 ton	400.00	220.00
174(h)	Laying 6" steel gas pipe	60 lf	8.00	10.00
205	Restoration vit. clay ducts	9,700 dt f	1.50	.60
217(d)	Maint. etc. steel pipe elec. ducts for 2"	50 dt f	6.00	1.40
217(e)	Maint. etc. steel pipe elec. ducts for 2½"	75 dt f	6.00	1.70
217(f)	Maint. etc. steel pipe elec. ducts for 3"	400 dt f	6.00	2.20
217(g)	Maint. etc. steel pipe elec. ducts for 3½"	75 dt f	6.00	2.80
220(g)	Furn. & laying new 3½" steel pipe elec. ducts	150 dt f	10.00	5.80
501-C	White glazed tile	34,000 sf	4.80	2.60
512(b)	Colored enameled tile	400 sf	6.50	3.30
513	Mosaic bands	4,600 sf	14.00	7.50
514	Mosaic name tablets	750 sf	24.00	13.00
514D	Weatherproof title name tablets	25 sf	30.00	16.00
515E(a)	Mosaic placques on sta. walls	65 sf	20.00	10.00
515E(c)	Placques with I. U T. with mosaic borders	200 sf	18.00	10.00
515E(e)	Tile placques with inscriptions, etc	550 sf	22.00	13.00
515E(f)	Remove exist. tile wall finish	350 sf	6.00	3.00
519(a)	Marbe wainscot for straight	210 sf	18.00	6.00
519(j)	Removing & resetting exist. marble	125 sf	10.00	4.00
522G(a)	Plastering	75 sv	8.00	3.00
523(a)	Cement wainscot or base	2,600 sf	1.25	1.20
523(d)	Cement finish	80 sf	1.50	1.20
523(f)	1" floor fin. (mono.)	1,000 sf	.50	.30
523(j)	3" floor fin. (mono.)	22,000 sf	.60	.50
524M	Protective concr. for encasing col	3,000 cf	12.00	10.00
527(a)	Front brick	3,850 sf	1.75	3.00
527(c)	Common brick	300 cf	5.00	4.50
528A	Weepholes	425 ea	.50	1.00
528-B	Anchors	1,200 ea	2.00	2.00
528-H	Hollow tile	3,700 cf	4.00	3.00
535K(a)	Kalamein doors type "A"	4 ea	400.00	150.00
535K(b)	Kalamein doors type "B"	6 pr	600.00	250.00
535S(fb)	Type "FbS" doors	3 pr	300.00	120.00
536-L	Removable screens	900 sf	18.00	3.00
540H(g)	Enameled sign plates	125 sf	18.00	6.00
540H(z)	Integral signs	100 sf	8.00	7.00
544(a)	Oak handrail	40 lf	6.00	2.00
546-B	Platform edge const	2,200 lf	1.25	1.50
544(b)	Steel elec. conduits—1"	6,000 lf	2.30	1.70
555(a)	4" x 4" x 2" outlet boxes	5 ea	11.00	10.00
555(b)	4" x 4" x 2" bottomless boxes & adapters	25 ea	8.00	7.00
555(c)	4" x 4" x 3" outlet boxes	400 ea	12.00	9.00
556(f)	6" x 6" x 4" c. i. pull boxes	30 ea	19.00	14.00
556-E(a)	6" x 12" x 4" ebony asb. boxes	8 ea	120.00	90.00
653	Removing c. i. collars at bases of c. i. cols.	370 ea	5.00	5.00
850-FO	Precast concr. fence in place	75 lf	20.00	30.00
P-1007	Prot. exist. cables in manholes	130 ea	110.00	75.00
P-1008(a)	Furn. & install. 3-cond. 000 A.W.G. A.C. cables	5,400 lf	7.30	5.00
P-1008(b)	Furn. & install. 3-cond. No. 6 A.W.G. A.C. cables	1,500 lf	6.00	4.50
P-1009(a)	Furn. & install. single-cond. 2000 MCM-D.C. cables	4,200 lf	11.00	8.00
P-1010(a)	Furn. & install. cable supports—T-iron racks	320 lf	8.00	6.00
P-1010(b)	Furn. & install. cable supports—one way cable arms	36 ea	5.50	4.00
P-1010(c)	Furn. & install. cable supports—two-way cable arms	130 ea	6.10	5.00
P-1010(d)	Furn. & install. cable supports—three-way cable arms	80 ea	8.80	7.00
P-1010(e)	Furn. & install. cable supports—four-way cable arms	10 ea	11.00	8.00
P-1010(f)	Furn. & install. cable supports—porcelain saddle block insulator	600 ea	1.50	1.20
P-1011(a)	Remov. & deliv. 2.1" to 2.5" power cables	3,700 lf	2.50	2.00
P-1011(b)	Remov. & deliv. 1.5" to 2.09" power cables	5,600 lf	2.00	1.50
P-1012(a)	Remov. & reinstall. exist. cable supports—T-iron racks	25 ea	24.00	16.00
P-1012(b)	Remov. & reinstall. exist. cable supports—cable arms	130 ea	1.50	1.00
P-1012(c)	Remov. & reinstall. exist. cable supports—porcelain saddle block insulators	300 ea	.50	.50

Dearborn Street Subway, Chicago, Illinois

OWNER: City of Chicago, Department of Subways and Superhighways, Dick Van Gorp, Chief Engineer.

PROJECT: Construction of complete Dearborn St. subway, starting from Dearborn and Van Buren Sts., where shields have been left in ground, and continuing to Congress St., then west on Congress St. to the east bank of the south branch of the Chicago River.

CONDITIONS: Some shoring of buildings is expected. All materials are to be furnished by the contractor. Stipulated contract time is 540 calendar days. Skilled wages range up to $2.25 per hour, and semi-skilled, to $1.60, while common labor wages are $1.30 per hour.

BIDS: Three bids were received August 29, 1946, ranging from the low bid of $8,235,134.50 to $8,962,760.00

LIST OF BIDDERS:

1. S. A. Healy Co. and Peter Kiewit Sons Co., Chicago, Ill.	$8,235,134.50
2. Michael Pontarelli, Inc., Chicago, Ill.	8,754,220.00
3. M. J. Boyle & Co., Chicago, Ill.	8,962,760.00

	Item	Quantity	Unit Prices		
			(1)	(2)	(3)
G-1	Station tube section	530 lin. ft.	$1,830.00	$2,330.00	$1,850.00
G-2	Single tube sec., 20′-9″ inter-				

Continued on next page

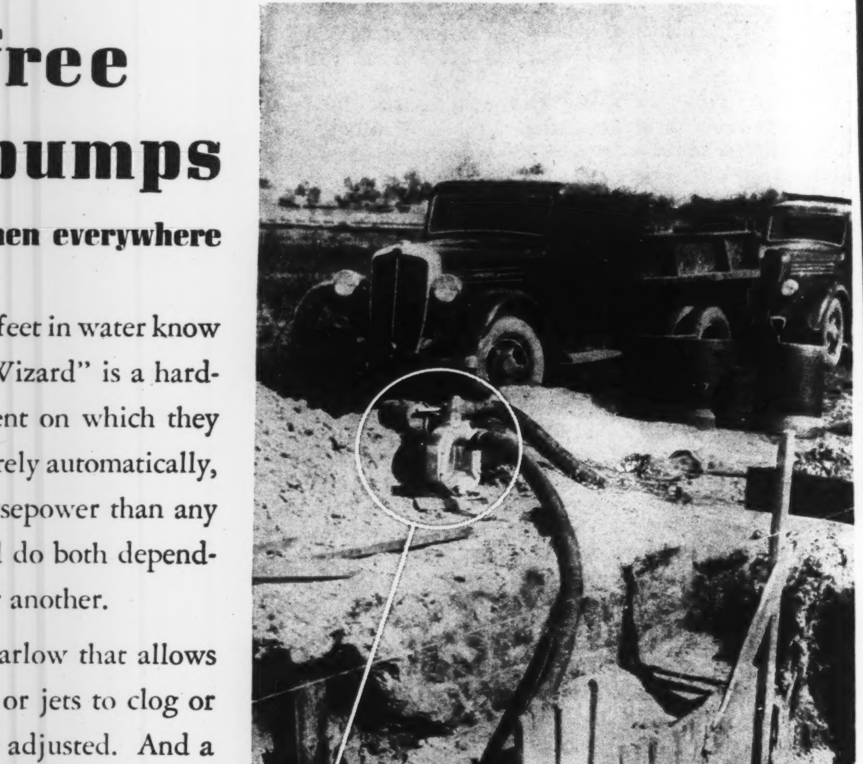
Trouble-free Marlow pumps

stand by construction men everywhere

Men who have to get their feet in water know this—a Marlow "Water Wizard" is a hard-working piece of equipment on which they can rely. It will prime entirely automatically, pump more liquid per horsepower than any other pump of its type and do both dependably, on one hard job after another.

There's nothing in a Marlow that allows trouble to start. No ports or jets to clog or jam. Nothing to be set or adjusted. And a Marlow is made extra strong in every part.

Marlow "Water Wizard" Self-Priming Centrifugals are made in 1½ to 10-inch sizes, 3,000 to 240,000 gallons per hour. Send for interesting Marlow booklets. Marlow Pumps, 510 Greenwood Ave., Ridgewood, New Jersey.



MARLOW PUMPS

Manufacturers of Quality Pumps Since 1924

Dearborn Street Subway, Chicago, Illinois

Continued from preceding page

	nal diam.	1,555 lin. ft.	1,240.00	1,240.00	1,580.00
G-3	Excavation in open cut for crossover, mezzanine station and station tube sect.	28,000 cu. yd.	20.00	20.00	19.00
G-4	Excavation in open cut for aux. structures	3,450 cu. yd.	22.00	23.00	20.00
G-5	Excavation in tunnel for special structures	1,000 cu. yd.	15.75	20.00	25.00
G-6	Removal of freight tunnels and any other concr. in tunnels	720 cu. yd.	50.00	5.00	75.00
G-7	Sand backfill in open cut	8,300 cu. yd.	3.00	2.50	3.00
G-8	Sand backfill in tunnel	500 cu. yd.	8.00	4.00	10.00
G-9	Cl. A concr. for crossover, mezzanine station and station tube sect	7,200 cu. yd.	50.00	35.00	42.00
G-10	Cl. A concr. in open cut for aux. structures	1,540 cu. yd.	50.00	35.00	50.00
G-11	Cl. A concr. in tunnel for special structures	560 cu. yd.	25.00	50.00	31.50
G-12	Cl. B concr. for loading platform	580 cu. yd.	44.50	28.00	50.00
G-13	Cl. A concr. bulkheads in freight tunnel	100 cu. yd.	124.20	30.00	100.00
G-14	Fill concrete	350 cu. yd.	19.25	20.00	15.00
G-15	Concrete pavement	180 sq. yd.	4.00	10.00	3.25
G-16	Sidewalks, curbs and gutters.	850 cu. ft.	1.00	1.50	1.00
G-17	Waterproofed sidewalks	300 cu. ft.	1.40	2.00	1.75
G-18	Timber for stairs, barricades and misc. work	7 M. ft. B.M.	200.00	200.00	250.00
G-19	Timber bulkheads	13 M. ft. B.M.	200.00	200.00	300.00
G-21	Reinforcement steel	5,200,000 lb.	.09	.07	.08
G-22	Furnishing and installing struct. steel	800,000 lb.	.15	.10	.15
G-23	Steel angles for anchorage	300 lin. ft.	1.25	4.00	2.00
G-24	Core borings	50 lin. ft.	6.00	10.00	7.50
G-25	Copper flashing	1,200 lb.	1.00	1.00	1.50
G-26	Membrane waterproofing	2,400 sq. yd.	5.40	3.00	4.00
G-27	Preformed waterproofing	600 sq. ft.	.35	1.00	1.00
G-28	Premoulded joint filler	300 sq. ft.	.50	1.00	1.00
G-29	Additional excavation in tunnel	200 cu. yd.	5.00	5.00	5.00
G-30	Rock excavation	50 cu. yd.	5.00	5.00	5.00
G-31	Additional cl. A concrete in tunnel	100 cu. yd.	12.00	12.00	12.00
G-32	Grout for stopping leaks	500 bbl.	10.00	10.00	10.00
G-33	Sub-piers for structure 5-D	1,200 cu. ft.	2.50	5.00	3.00
G-34	Single tube sect. 18′-0″ internal width	1,100 lin. ft.	875.00	1,190.00	825.00
G-35	Single tube sect. 16′-6″ internal width	640 lin. ft.	840.00	1,040.00	800.00
G-36	Single tube sect. 16′-0″ internal width	635 lin. ft.	830.00	1,040.00	785.00
G-37	Junction at S. Wells St	lump sum	531,000.00	350,000.00	615,000.00
G-38	Single tube sect. 15′-0″ internal width	80 lin. ft.	826.00	790.00	775.00
M-1	Galvanized steel grating	1,300 sq. ft.	3.50	5.00	4.00
M-2	Miscellaneous steel	32,000 lb.	.35	.16	.30
M-3	Miscellaneous iron castings	31,000 lb.	.50	.25	.40
M-4	Bell and spigot c. i. pipe, 12 ft. and over	158,000 lb.	.10	.15	.11
M-5	Bell and spigot cast iron pipe over 3 ft. and less than 12 ft.	79,000 lb.	.15	.20	.15
M-6	Bell and spigot c. i. pipe, 3 ft. or less, and fittings	41,000 lb.	.20	.22	.28
M-7	3 and 4 in. threaded c. i. pipe.	150 lin. ft.	1.00	3.00	1.50
M-8	3 and 4 in. fittings for threaded pipe	30 ftgs.	20.00	5.00	40.00
M-9	Pipe railing	50 lin. ft.	1.25	4.00	3.00
M-10	Steel spiral stairs	6,500 lb.	.75	.30	1.00
M-11	Steel doors, frames and louvers	lump sum	[illegible],000.00	5,000.00	5,000.00
M-12	1-in. lead water service	20 lin. ft.	1.00	2.00	3.00
M-13	Pumping equipment	lump sum	10,000.00	20,000.00	7,500.00
E-1	Type A outlet boxes	750 boxes	5.25	10.00	7.00
E-2	Type B outlet boxes	250 boxes	5.85	10.00	5.00
E-3	Pull boxes, special boxes and covers	600 lb.	1.30	2.00	2.00
E-4	¾ in. and smaller, rigid galv. electric conduit	3,500 lin. ft.	.41	.80	.40
E-5	1-in. rigid, galv. electric conduit	32,000 lin. ft.	.51	.90	.50
E-6	1¼-in. rigid, galv. electric conduit	1,200 lin. ft.	.65	1.20	.60
E-7	1½-in. rigid, galv. electric conduit	800 lin. ft.	.71	1.70	.80
E-8	2-in. rigid, galv. electric conduit	300 lin. ft.	.91	2.25	1.00
E-9	2½-in. rigid, galv. electric conduit	100 lin. ft.	1.23	3.00	1.25
E-10	3-in. rigid, galv. electric conduit	300 lin. ft.	1.61	3.50	1.50
E-11	3½-in. rigid galv. electric conduit	6,000 lin. ft.	1.95	4.70	2.00
E-12	4-in. rigid, galv. electric conduit	300 lin. ft.	2.45	5.00	2.50
E-13	3½-in. asbestos cement, stone or clay tile duct	16,000 lin. ft.	1.00	.80	1.50
E-14	Electrical work for power and lighting	lump sum	29,000.00	40,000.00	35,000.00
F-1	Excavation for reconst. of freight tunnel	2,600 cu. yd.	27.00	30.00	30.00
F-2	Cl. A concr. for reconst. of freight tunnel	1,100 cu. yd.	44.25	35.00	40.00
F-3	2-in. galv. steel pipe incl. fittings	100 lin. ft.	.75	1.00	1.00
R-1	Shoring of La Salle St. R. R. Sta. track columns, types A, B and C	22 cols.	4,530.00	5,000.00	6,000.00
R-2	Shoring of La Salle St. R. R. Sta. track columns, Type D	66 cols.	3,125.00	3,500.00	4,500.00
R-3	Shoring of La Salle St. R. R. Sta. track columns, types E and F	25 cols.	3,650.00	4,000.00	6,000.00
R-4	Shoring of La Salle St. R. R. Sta. building columns, types G, H, and J	12 cols.	3,800.00	4,100.00	5,500.00
R-5	Sub-piers for La Salle St. R. R. Sta. columns	44,000 cu. ft.	2.75	3.00	2.80
R-6	Excavation for cap girders for La Salle St. R. R. Sta	700 cu. yd.	17.20	20.00	30.00
R-7	Cl. A concr. for cap girders for La Salle St. R. R. Sta	470 cu. yd.	14.25	25.00	25.00
R-8	Misc. steel for columns of La Salle St. R. R. Sta	5,000 lb.	.12	.20	.20
R-9	Temporary facils. in La Salle St. R. R. Sta.	lump sum	4,200.00	8,000.00	15,000.0

Railroad for Garrison Dam, North Dakota

OWNER: U. S. Engineers, Omaha District Lt. Col. D. B. Freeman, District Engineer, Omaha, Nebr.

PROJECT: Access Railroad including all grading, drainage, track, to Garrison Dam site, North Dakota, 10 miles of track, 171,000 cu.yd. excavation. This contract carries railroad only to townsite of Riverdale on bluff east of dam. Future contract will extend route down side of valley to construction bridge site.

CONDITIONS: Owner will furnish rail, tie plates, joint bars, track bolt, contractor to furnish other materials. Rail transportation at one end of job, highway at one end. Grading fairly light. Good ballast scarce in vicinity. Minimum wage rates specified: ironworkers, structural, $1.50; reinforcing, $1.44; carpenters, $1.25; operators: compressor, $1.00; cranes and shovels and draglines, $1.50; hoists, $1.40; motor graders, $1.40; pavers, $1.40; mixers, $1.00; pile drivermen, $1.25; rollers (to 8 tons), $1.20; (over 8 tons), $1.40; tractors, $1.30; trucks, 80c.; common labor, 70c.

BIDS: Six bids were received April 2, 1946, ranging from the contract low $398,215.45 to $703,181.78, compared with the government estimate, $447,402.21.

LIST OF BIDDERS:

1.	Wm. A. Smith Constr. Co., Houston, Tex. (contract)	$398,215.45
2.	Northwestern Engr. Co., Rapid City, S. Dak.	474,426.35
3.	S. J. Groves & Sons Co., Minneapolis, Minn.	476,875.30
4.	Peter Kiewit Sons Co., Omaha, Nebr. & Morrison-Knudsen Co., Seattle, Wash.	479,664.78
5.	Okes Construction Co., St. Paul, Minn.	551,729.05
6.	Kramme & Jensen Constr. Co., Des Moines, Iowa	703,181.78

Item	Quantity	Unit Prices (1)	Unit Prices (2)	Unit Prices (3)
1. Unclassified Excavation	171,200 cu. yd.	$ .25	$ .225	$ .22
2. Water for Embankment Compaction	5,025 1000 gal.	.55	.50	.50
3. Rolling for Additional Compaction	200 roller hr.	4.40	4.00	4.00
4. Structural Excavation	1,500 cu. yd.	1.10	1.00	1.00
5. Main Track and Ballast	50,694 lin. ft.	4.35	5.55	5.85
6. Side Track and Ballast	7,714 lin. ft.	3.55	5.55	5.15
7. Turnouts, No. 7	8 each	1,200.00	1,500.00	1,450.00
8. Turnouts, No. 9	4 each	1,250.00	1,650.00	1,620.00
9. Switch Stands, Intermediate Type	4 each	50.00	300.00	60.00
10. Switch Stands, Low Type	4 each	40.00	300.00	30.00
11. Derailers	4 each	25.00	50.00	30.00
12. Bumping Posts	2 each	200.00	50.00	130.00
13. Furnishing and Installing 15-inch Circular Corrugated Metal Pipe	398 lin. ft.	2.00	1.86	2.00
14. Furnishing and Installing 18-inch Circular Corrugated Metal Pipe	136 lin. ft.	2.75	2.50	2.25
15. Furnishing and Installing 24-inch Circular Corrugated Metal Pipe	154 lin. ft.	3.50	3.13	3.25
16. Furnishing and Installing 30-inch Circular Corrugated Metal Pipe	60 lin. ft.	4.25	3.78	4.50
17. Furnishing and Installing 36-inch Circular Corr. Met. Pipe (14 gauge)	222 lin. ft.	5.00	4.52	5.00
18. Furnishing and Installing 36-inch Circular Corr. Met. Pipe (10 gauge)	130 lin. ft.	7.50	6.89	7.5
19. Furnishing and Installing 42-inch Circular Corrugated Metal Pipe	102 lin. ft.	7.75	6.96	7.00

Continued on next page

FOR EVERY TYPE OF

CONCRETE REINFORCEMENT

THESE THREE FAMOUS, HIGH QUALITY BRANDS OF

Welded Wire Fabric

CF&I

CLINTON
WICKWIRE SPENCER STEEL
14 Lafayette Sq., Buffalo, N. Y.

CALWICO
THE CALIFORNIA WIRE CLOTH CORP.
1001 22nd Ave., Oakland, Cal.

COLORADO
THE COLORADO FUEL & IRON CORP.
Continental Oil Bldg., Denver, Colo.

Railroad for Garrison Dam North Dakota

Continued from preceding page

20. Furnishing and Installing 48-inch Circular Corrugated Metal Pipe	128 lin. ft.	10.25	9.33	9.50
21. Furnishing and Installing 18-inch by 11-inch Corrugated Metal Pipe Arch	24 lin. ft.	2.40	2.08	2.25
22. Furnishing and Installing 29-inch by 18-inch Corrugated Metal Pipe Arch	100 lin. ft.	4.00	3.57	4.00
23. Furnishing and Installing 36-inch by 22-inch Corrugated Metal Pipe Arch	52 lin. ft.	5.00	4.46	5.00
24. Furnishing and Installing 43-inch by 27-inch Corrugated Metal Pipe Arch	84 lin. ft.	7.50	6.74	7.50
25. Furnishing and Installing 50-inch by 31-inch Corrugated Metal Pipe Arch	102 lin. ft.	11.50	8 46	9.00
26. Furnishing and Installing 58-inch by 36-inch Corrugated Metal Pipe Arch	64 lin. ft.	12.00	9.92	12.00
27. Furnishing and Installing 72-inch Circular Multi-Plate Corr. Met. Pipe	165 lin. ft.	30.00	27.00	20.00
28. Railroad Overpass, Excluding Piling, Rail, Guard Rail and Appurtenances	lump sum	28,500.00	28,225.00	26,037.00
29. Rail, Guard Rail Appur. for Overpass	lump sum	500.00	3,000.00	250.00
30. Piling, Excluding Cut-off	4,120 lin. ft.	2.75	2.75	3.00
31 Grade Crossings, Road	312 lin. ft.	8.00	8.00	7.40
32 Grade Crossings, Farm	144 lin. ft.	6.00	5.00	4.00
33. Crossing Approach Surfacing	26 cu. yd.	4.00	5.00	2.00
34 Right-of-Way Fence	3,810 rod	2.65	2.35	2.50
35. Removal & Disp. of Exist. Fencing	45 rod	1.00	.55	.50
36. Gates. 16-foot Width	18 each	25.00	100.00	50.00
37. Snow Fence	3,890 lin. ft.	3.25	3.00	2.90
38. Stock Guards	15 each	200.00	100.00	150 00
39. Highway Crossing Signs	18 each	60.00	35.00	50.06
40. Derail Signs	4 each	30.00	35.00	15.00
41. Whistle Signs	16 each	30.00	35.00	15.00
42. Mile Post Signs	10 each	30.00	35.00	15.00
43. Track Car Set-Offs	9 each	40.00	150.00	18.00

Warehouse Building at Hungry Horse Government Camp, Kalispell, Mont.

OWNER: BUREAU of Reclamation, Hungry Horse Project, Montana, Mr. Paul A. Jones, Project Engineer.

PROJECT: Construction of warehouse building consisting of storage section "A", 60′x120′, height to be 14′ to the bottom chords of the roof trusses and separated from sections "B" and "C" by a concrete fire wall; crane storage section "B", 40′x260′; height 27′ to bottom chords of roof trusses, with rear side open to section "C"; shed storage section "C", 30′x200′. Foundations of all sections and outside walls to a height of 4 ft. will be concrete. Framework above concrete walls will be structural steel covered with corrugated steel sheets. A 10-ton travelling crane will be installed in section "B".

CONDITIONS: Government will furnish 10-ton crane, all structural steel framing, sheet metal, including corrugated siding and roofing, metal windows and doors, metal jambs and heads to be embedded in concrete, cement for use in concrete and grout, field rivets, roof ventilators, safety flues, and unit heaters. Materials so furnished will be delivered to the contractor F.O.B. cars at Columbia Falls, Montana, and hauled by contractor to job site, approximately 8 miles east of Columbia Falls. Contract time, 150 calendar days. Wage rates as follows: common laborers, $.90, carpenters, $1.38, cement finishers, $1.50, electricians, $1.45, plumbers, $1.375, roofers, $1.25, sheet metal workers, $1.25, and truck drivers, $.95 to $1.50.

BIDS: Five bids were received May 28, 1946, ranging from $91,288.00 to $131,389.00.

LIST OF BIDDERS:

1. Dudley Const. Co., Great Falls, Mont.	$91,288.00
2. Montana Engrg. & Const. Co., Helena, Mont.	104,620.00
3. Fred R. Comb Co., Minneapolis, Minn.	123,150.00
4. Midland Constructors, Inc., Chicago, Ill.	130,000.00
5. Askvold Const. Co., Inc., Great Falls, Mont.	131,389.00

Item	Quantity	Unit Prices (1)	(2)	(3)
1. Excavation	1,500 cu. yd.	$2.50	$2.50	$3 00
2. Compacted backfill	2,500 cu. yd.	2.25	4.00	3.00
3. Concrete, except in floors	740 cu. yd.	32.00	40.00	45.00
4. Concrete in floors	455 cu. yd.	20.00	35.00	25.00
5. Furnishing and placing reinforcement bars and fabric	101,000 lbs.	.11	.12	.10
6. Furnishing and placing pea-gravel fill	2,700 sq. yd.	.40	.50	1.25
7. Erecting steel warehouse	lump sum	36,943.00	31,875.00	53,000.00

Transmission and Distribution Lines for Boysen Unit, Wyoming

OWNER: Bureau of Reclamation, Boysen Unit, Wyoming, Missouri Basin Project; Mr. R. S. Lieurance, Thermopolis, Wyo., Acting Project Engineer.

PROJECT: a) Construction of 34.5-kilovolt single-wood-pole transmission line from existing Pilot Butte-Thermopolis line approximately 12 miles to Boysen Dam construction substation. Conductors to be No. 1/0 A.W.G. bare stranded, steel reinforced, aluminum cable; No 2 A.W.G. bare copper conductor: or copperweld-copper conductor, No. 2A, three strand, No. 2 A.W.G. copper equivalent.

b) Construction of 2400-volt, single-wood-pole distribution line approximately 1½ miles long. Conductors to be of No. 2/0 A.W.G. seven-strand bare copper.

c) Construction of Boysen Government Camp wood-pole electrical distribution system. The 2400-volt primary circuits will use No. 2 A.W.G. stranded, bare copper conductor; the 220/110-volt secondary circuit, three No. 2 A.W.G. weather-proof wire; and street lighting system, No. 4 A.W.G. stranded, bare copper conductor.

CONDITIONS: Government will furnish all transmission-line and distribution-system materials that will be part of the completed work. Contractor is responsible for hauling and storing materials. Completion time, 60 calendar days. Wages: laborers, $0.85, truck drivers, $0.70 to $0.85, air-tool operators, $1.00, carpenters and brush painters, $1.40, and electricians and spray painters, $1.50.

BIDS: Three bids were received April 29, 1946, and award was made on May 29, 1946 on basis of bid item 21(a) and elimination of items 21(b) and 21(c). Bids ranged from the contract low of $29,536 to $45,438.

LIST OF BIDDERS:

1. S. H. Reither, Aitken, Minnesota (contract)	$29,536
2. Donovan, Inc., St. Paul, Minnesota	38,814
3. Olson Construction Co., Salt Lake City, Utah	45,438

Item	Quantity	Unit Prices (1)	(2)	(3)
Part 1 — 34.5-kilovolt transmission line				
1. Clear land and right-of-way	lump sum	$500.00	$1,500.00	$1,500.00
2. Constr. SS structures with 35′ pole.	10 structures	35.00	48.00	50.00
3. Constr. SS structures with 40′ pole.	56 structures	40.00	48.00	60.00
4. Constr. SS structures with 45′ pole.	115 structures	45.00	58.00	70.00
5. Constr. SD structures with 40′ pole.	2 structures	50.00	50.00	70.00
6. Constr. SD structure with 45′ pole.	1 structure	55.00	60.00	80.00
7. Constr. STR structures with 45′ pole.	4 structures	55.00	58.00	80.00
8. Constr. SA structures with 40′ pole.	2 structures	55.00	50.00	75.00
9. Constr. ST structures with 45′ pole.	10 structures	70.00	108.00	100.00
10. Constr. HS structure with 45′ poles.	1 structure	70.00	170.00	150.00
11. Constr. HS structures with 50′ poles	5 structures	75.00	180.00	150.00
12. Constr. HT structure with 45′ poles.	1 structure	105.00	230.00	150.00
13. Constr. ST structures with 50′ poles.	3 structures	115.00	400.00	250.00
14. Constr. two HSWT structures with 40′ poles and two HT structures with 35′ poles, to replace existing pole and make tap connections	lump sum	550.00	1,000.00	1,500.00
15. Constr. single guys with wood strain insulators	10 single guys	8.00	10.00	15.00
16. Constr. double guys with wood strain insulators	5 double guys	12.00	15.00	25.00

Continued on next page

Transmission and Distribution Lines for Boysen Unit, Wyoming

Continued from preceding page

17. Place plate anchors	15 plate anchors	10.00	16.00	25.00
18. Install pin-type insulators	600 insulators	1.00	0.50	1.00
19. Assemble and attach suspension-insulator assemblies with two insulator units	18 assemblies	1.00	1.00	2.00
20. Assemble and attach tension-insulator assemblies with three insulator units	30 assemblies	1.50	1.50	3.00
12(a). String No. 1/0 A.W.G. aluminum cable, steel reinf.	12 3-ph. circuit mi.	450.00	400.00	500.00
21(b). String No. 2 A.W.G. copper conductor	12 3-ph. circuit mi.	350.00	360.00	600.00
21(c). String No. 2 A.W.G. equiv. copper-weld-copper conductor.	12 3-ph. circuit mi.	325.00	360.00	550.00
22. Assemble and attach X-braces	11 X-braces	15.00	8.00	20.00
23. Attach vibration dampers for alum. conductors	100 dampers	1.00	4.00	3.00
Part 2— 2,400-volt distribution line				
24. Clear land and right-of-way	lump sum	500.00	200.00	500.00
25. Constr. SS structures with 30′ pole.	4 structures	25.00	48.00	50.00
26. Constr. SS structures with 35′ pole.	8 structures	30.00	48.00	50.00
27. Constr. SS structures with 40′ pole.	5 structures	35.00	48.00	60.00
28. Constr. SD structure with 30′ pole.	1 structure	35.00	50.00	50.00
29. Constr. SD structures with 35′ pole.	2 structures	40.00	50.00	50.00
30. Constr. SD structure with 40′ pole.	1 structure	45.00	50.00	70.00
31. Constr. ST structures with 40′ pole.	2 structures	60.00	100.00	100.00
32. Constr. ST structures with 45′ pole.	2 structures	70.00	108.00	100.00
33. Constr. SA structures with 55′ pole.	2 structures	60.00	64.00	100.00
34. Constr. SAT structures with 55′ poles	2 structures	65.00	120.00	125.00
35. Constr. stub guys with 30′ poles	2 stub guys	28.00	50.00	75.00
36. Constr. single guys	18 single guys	6.00	10.00	15.00
37. Constr. double guys	8 double guys	10.00	15.00	25.00
38. Place plate anchors	28 plate anchors	10.00	16.00	25.00
39. Install pin-type insulators	63 insulators	1.00	0.50	1.00
40. Assemble and attach single-unit tension insulators	24 assemblies	1.00	1.00	1.50
41. String three No. 2/0 A.W.G. hard-drawn, bare, 7-strand copper conductors	1½ 3-wire circuit mi. of line	450.00	400.00	700.00
Part 3 — Electrical distribution system				
42. Set 30-foot poles	5 poles	15.00	20.00	30.00
43. Set 35-foot poles	25 poles	20.00	20.00	35.00
44. Set 40-foot poles	35 poles	25.00	20.00	40.00
45. Set 45-foot poles	20 poles	30.00	24.00	45.00
46. Assemble and attach single four-pin cross arms to poles	10 cross arms	6.00	4.00	10.00
47. Assemble and attach double four-pin cross arms to poles	15 cross arms	14.00	10.00	20.00
48. Assemble and attach single six-pin cross arms to poles	20 cross arms	8.00	4.00	15.00
49. Assemble and attach double six-pin cross arms to poles	40 cross arms	17.00	10.00	20.00
50. Assemble and attach transformer foot arms to poles	20 arms	17.00	2.00	5.00
51. Install pin-type insulators	250 insulators	1.00	0.30	0.50
52. Attach structure numbers to poles.	85 numbers	1.00	0.30	1.00
53. Install secondary racks on poles	50 racks	3.00	2.00	3.00
54. Install secondary racks on houses	80 racks	3.00	2.00	3.00
55. Attach dead end straps to secondary racks	40 straps	1.00	1.00	1.00
56. Install insulated clevises	160 clevises	1.50	2.00	1.00
57. Install one 10-kv.-a. transformer on pole, compl. with protective equip	4 transformers	20.00	50.00	25.00
58. Install one 15-kv.-a. transformer on pole, compl. with protective equip	4 transformers	30.00	50.00	30.00
59. Install one 25-kv.-a. transformer on pole, compl. with protective equip	6 transformers	50.00	50.00	40.00
60. Install one 37.5-kv.-a. transformer on pole, compl. with protective equip	2 transformers	75.00	70.00	50.00
61. Install one 50-kv.-a. transformer on pole, compl. with protective equip	1 transformer	100.00	100.00	75.00
62. Install two 10-kv.-a. transformers per pole, compl. with protective equip	1 set	40.00	100.00	40.00
63. Install two 15-kv.-a. transformers per pole, compl. with protective equip	1 set	60.00	100.00	50.00
64. Install two 25-kv.-a. transformers per pole, compl. with protective equip	1 set	100.00	100.00	75.00
65. Install two 37.5-kv.-a. transformers per pole, compl. with protective equip	1 set	150.00	140.00	90.00
66. Install two 50-kv.-a. transformers per pole, compl. with protective equip	1 set	200.00	240.00	125.00
67. Install three 10-kv.-a. transformers per pole, compl. with protective equip	1 set	60.00	120.00	60.00
68. Install three 15-kv.-a. transformers per pole, compl. with protective equip	1 set	90.00	120.00	75.00
69. Install three 25-kv.-a. transformers per pole, compl. with protective equip	1 set	150.00	120.00	100.00
70. Install 10-kv.-a. constant current regulator (transformer) on pole, compl. with oil switch and protective equip	1 regulator	30.00	100.00	100.00
71. Install ground wire on poles	400 ft.	0.10	0.10	0.50
72. Install ground connections	14 connections	3.00	6.00	2.00
73. Constr. stub guys with 30-foot poles	5 stub guys	28.00	50.00	30.00
74. Constr. single guys	40 single guys	5.00	10.00	15.00
75. Constr. double guys	10 double guys	10.00	15.00	25.00
76. Place plate anchors	50 plate anchors	10.00	16.00	25.00
77. String three No. 2 A.W.G. bare copper conductors	4,000 3-wire-circuit ft. of line	0.07	0.24	0.15
8. String two No. 2 A.W.G. bare copper conductors	2,000 2-wire-circuit ft. of line	0.05	0.16	0.13
79. String two No. 4 A.W.G. bare copper conductors	2,000 2-wire-circuit ft. of line	0.04	0.16	0.12
80. String one No. 4 A.W.G. bare copper conductor	1,000 Single-wire-circuit ft. of line	0.02	0.12	0.10
81. String three No. 2 A.W.G. weather-proof wires	3,000 3-wire-circuit ft. of line	0.10	0.24	0.20
82. String three-wire service drops with two No. 2 A.W.G., and one No. 4 A.W.G. weatherproof wires	7,000 3-wire-circuit ft. of line	0.10	0.30	0.25
83. String two-wire service drops with two No. 2 A.W.G. weatherproof wires	4,500 2-wire-circuit ft. of line	0.07	0.24	0.20
84. Install bracket street lamps	20 lamps	5.00	10.00	10.00

Governors Island Shaft—Brooklyn-Battery Tunnel, New York City

OWNER: New York City Tunnel Authority, Engineers Office Building, New York City, Mr. Ralph Smillie, chief engineer.

PROJECT: The excavation in earth and in rock, outside the limits of rock tunnel excavation previously performed by others at the Governors Island Shaft of the Brooklyn-Battery Tunnel, located northeast of Governors Island, including the sinking of a caisson for said shaft to ledge rock and for a certain distance into ledge rock; the furnishing and placing of concrete lining and interior construction inside the Governors Island shaft; the construction of foundation piers and the first floor of the Governors Island ventilation building, the remainder of which will be constructed under another contract; the construction of a fender structure with its appurtenances around the Governors Island shaft and a tidal breakwater between the fender structure and Governors Island; the construction and maintenance of a field office building for the use of the Engineer; and other incidental work.

CONDITIONS: Contractor to furnish all materials with the exception of ceiling tile—to be furnished by the Authority—and to complete the shaft within 20 consecutive calendar months and all other work under the contract in 22 months. The contractor is responsible for anticipating sub-soil materials, subsurface conditions and existing subsurface and submarine structures. Rail, highway and water transportation facilities available. Labor rates as specified in contract are, in part, as follows.

Work in Compressed Air
Work in pressures up to 18 pounds per sq. in.

Blasters	$14.50 per 6 hr. day
Gauge tenders	13.00 per 6 hr. day
Lock tenders	14.00 per 6 hr. day
Lock tenders helpers	13.00 per 6 hr. day
All other men	14.00 per 6 hr. day

For work at pressure greater than 18 lbs. per sq. in. Each man

Continued on page 211

Just out! **For Quick and Easy Construction Research...**

THE CONSOLIDATED INDEX
to
ENGINEERING NEWS-RECORD

For The Years 1928-1943 Inclusive

INDEX
TO
ENGINEERING
NEWS-
RECORD
1928 - 1943
McGRAW-
HILL
PUBLISHING
COMPANY
INC.

A CONSOLIDATED INDEX for the volumes of ENGINEERING NEWS-RECORD covering the years 1928-1943 inclusive is now available in durable book form.

This INDEX includes all articles and news items of permanent interest published during this 16 year period.

From Accelerometer to Zuyder Zee the INDEX will tell you at a glance where to look for every authoritative word on any subject published in ENGINEERING NEWS-RECORD from 1928 to 1943 inclusive.

It's an invaluable reference for consulting engineers—staff engineers—business libraries—school & college libraries—engineering offices—students—industrial libraries—contractors—public libraries—government libraries—statisticians.

Check These Important Index Values...

- It's the one quick and easy way to find authoritative information on all events of importance in the engineering construction field from 1928 through 1943.
- References in the alphabetical subject index are given by year, volume, and page; and abbreviations denote the type of article, as (a) abstracts, (e) editorial, (j) job and office, (l) letter, (n) news, (*) illustrated.
- INDEX contains 414 pages . . . geographical heads have been limited to those items which would not be readily found under any other head . . . subjects are carefully cross-indexed.
- Subject index follows in style and arrangement the indexes previously published from 1874 to 1927.
- INDEX is durably bound in attractive green cloth. It's designed to be a hard-working and permanent addition to your construction library.

Simplify your reference and research work in the construction field with this handy CONSOLIDATED INDEX.

To obtain your copy, detach the coupon below and mail it to The Editor, ENGINEERING NEWS-RECORD. 330 West 42nd St., New York 18, N. Y.

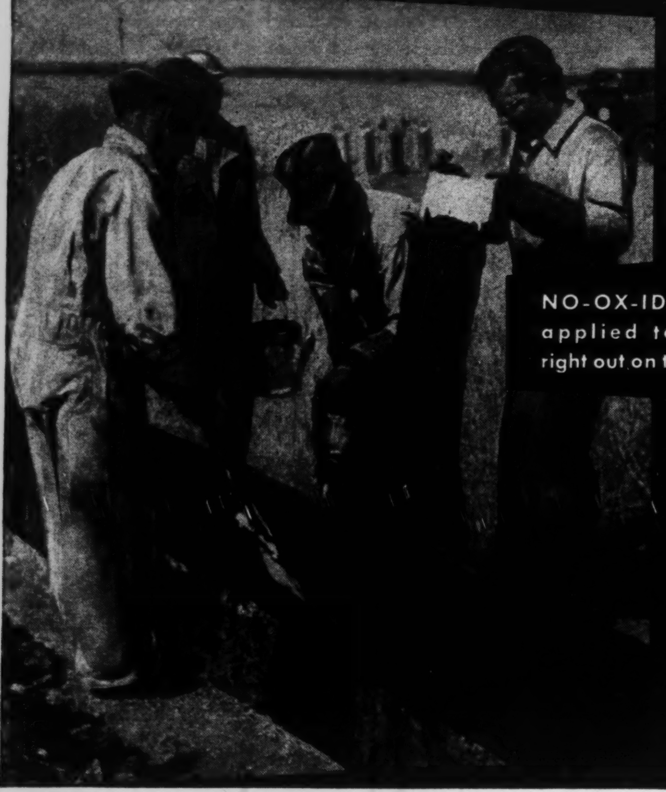
PRINT ORDER LIMITED
Send for your copy TODAY
PRICE $8.00

The Editor—ENGINEERING NEWS-RECORD • 330 West 42nd Street, New York 18, N. Y.
Please send me...........copies of the 414 page INDEX TO ENGINEERING NEWS-RECORD 1928-1943 at $8.00 each (Check enclosed). (Send bill for same).
Name..
Title..
Company..
Address..

Reconditioning Underground Pipe Lines With

NO-OX-ID

provides perfect protection . . .



NO-OX-ID being applied to pipe right out on the line.

For the first time in 5 years, many companies are instituting active reconditioning and new pipe programs.

NO-OX-ID and NO-OX-IDized Wrappers are again available for this important maintenance and new line work.

NO-OX-ID and NO-OX-IDized Wrapper protection can be applied either manually or by stationary or traveling machine depending upon local requirements.

This combination coating provides much more than insulation . . . it forms a tough plastic film most effective in excluding moisture, and other corrosion accelerators. NO-OX-ID contains rust inhibitors which immediately stop any corrosion that may be present on the pipe when the coating is applied. There's a Dearborn Service Engineer near by to help you . . . or write direct to us for further details.

NO-OX-ID
IRON RUST
REG. TRADEMARK AUG. 27, 1918

The ORIGINAL RUST PREVENTIVE

Dearborn Chemical Company
Dept. ER, 310 S. Michigan Ave., Chicago 4, Ill.
New York • Los Angeles • Toronto

Tunnel Shaft
Governors Island, New York

Continued from page 208

shall be paid an additional amount per day in accordance with the following table:

Air pressure	Additional Payment per day
18 lbs. and up to 26 lbs.	$1.00
26 lbs. and up to 33 lbs.	1.50
33 lbs. and up to 38 lbs.	2.00
38 lbs. and up to 43 lbs.	2.50
43 lbs. and up to 48 lbs.	3.00
48 lbs. and up to 50 lbs.	3.50

Other wage rates for work in free air ranges from 50c per hour for 1st year apprentices to $1.50 for semi-skilled labor and to $2.02½ for skilled.

BIDS: Seven bids were received December 11, 1945, ranging from $2,994,003.00 to $4,749,088.20. No contract.

LIST OF BIDDERS, Dec. 11, 1945:

1. Wagner Co., New York, N. Y.	$2,994,003
2. George H. Flinn Corp., New York, N. Y.	3.989.938
3. Stiefel Construction Corp., New York, N. Y.	4,199,139
4. Mason & Hanger Co. Inc., New York, N. Y.	4,391,510
5. Walsh Construction Co., New York, N. Y.	4,504,808
6. Spencer White & Prentis, Inc., New York, N. Y.	4,746,139
7. J. Rich Steers, Inc. and Peter F. Connolly, New York, N. Y.	4,749,088

BIDS: Five bids were received February 15, 1946, ranging from $3,594,580 to $4,746,139, and the contract was awarded to the low bidder, Grow Construction Co., Inc. The contract price is an increase of approximately 18.6 percent over the December low bid. The *Engineering News-Record* Construction Cost Index rose 6.04 percent in this same period.

LIST OF BIDDERS, Feb. 15, 1946:

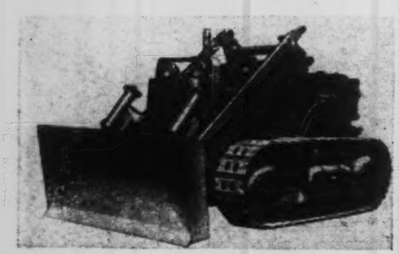
1. Grow Construction Co., Inc., New York, N. Y. (Contract)	$3,594,580
2. George H. Flynn Corp., New York, N. Y.	4,217,071
3. Mason & Hanger Co., Inc., New York, N. Y.	4,391,510
4. Walsh Construction Co., New York, N. Y.	4,505,008
5. Spencer, White & Prentis, Inc., New York, N. Y.	4,746,139

		Unit Prices		
Item	Quantities	Low Bid Dec. 1945	Feb. 1946 Bids (1)	(2)
1. Dredging incl. disposal	Lump Sum	$30,000.00	$70,000.00	$157,000.00
2. Shaft excavation in earth incl. disposal in any place selected by Contractor	9,800 c. y.	30.00	40.00	46.00
3. Shaft excavation in rock above final elev. of caisson cutting edge	1,600 c. y.	60.00	100.00	125.00
4. Shaft excavation in rock below final elev. of caisson cutting edge	8,500 c. y.	30.00	30.00	46.40
5. Cement used in concrete	21,800 bbl.	4.00	5.00	5.00
6. Concrete excl. cement	14,500 c. y.	30.00	30.00	24.00
7. Portland cement grout ejected through skin plates of caisson	150 bbl.	40.00	40.00	20.00
8. Permanent structural steel in caisson portion of shaft	2,050 ton	280.00	360.00	361.67
9. All structural steel not otherwise provided for	1,930 ton	240.00	260.00	284.10
10. Miscellaneous steel and iron	54,000 lb.	.30	.30	.30
11. Reinforcing rod trusses welded to skin plates of caisson	4,900 l. f.	1.00	2.00	2.50
12. Steel reinforcing bars not included in (11)	180 ton	200.00	240.00	223.00
13. Wire mesh used in reinforcing concrete other than under (14)	2,800 lb.	.30	.30	.52
14. Wire mesh for beam and column wrapping	8,400 lb.	.30	.30	.60
15. Furnishing and installing stainless steel ceiling hanger units	4 each	200.00	200.00	67.00
16. One-ply waterproofing	2,300 s. y.	2.00	2.00	2.23
17. Six-ply waterproofing	110 s. y.	6.00	6.00	5.44
18. Waterproofing brick in mastic	440 c. y.	150.00	150.00	169.00
19. Installing 4½-in. x 4½-in. ceramic ceiling tile without grippers, furnished by Authority	2,200 s. f.	1.00	1.00	1.41
20. Installing 6-in. x 6-in. glass ceiling tile with grippers furnished by Authority	2,200 s. f.	1.00	1.00	.94
21. Furnishing and installing 4-in. diam. c.i. bell and spigot cement lined pipe incl. fittings and specials	50 l. f.	4.00	4.00	4.61
22. Furnishing and installing 6-in. diam. c.i. bell and spigot cement lined pipe incl. fittings and specials	100 l. f.	6.00	6.00	5.95
23. Furnishing and installing 8-in. diam. c.i. bell and spigot cement lined pipe incl. fittings and specials	220 l. f.	8.00	8.00	7.60
24. Furnishing and installing 4-in. diam. flanged cement lined pipe incl. fittings, valves and specials	140 l. f.	4.00	4.00	5.55
25. Furnishing and installing 6-in. diam. flanged cement lined pipe incl. fittings, valves and specials	420 l. f.	6.00	6.00	7.11
26. Furnishing and installing 8-in. diam. flanged cement lined pipe incl. fittings, valves and specials	550 l. f.	8.00	8.00	9.01
27. Furnishing and installing 12-in. diam. flanged cement lined pipe incl. fittings, valves and specials	10 l. f.	20.00	20.00	17.10
28. Furnishing and installing 2-in. diam. galvanized W.I. pipe incl. fittings, valves, specials and metal supports	340 l. f.	2.00	2.00	2.68
29. Furnishing and installing 2½-in. diam. galvanized W.I. pipe incl. fittings, valves, specials and metal supports	30 l. f.	3.00	3.00	3.65
30. Furnishing and installing 3-in. diam. galvanized W.I. pipe incl. fittings, valves, specials and metal supports	40 l. f.	3.00	3.00	4.56
31. Furnishing and installing 3-in. diam. cement lined W.I. pipe incl. fittings, valves, specials and metal supports	390 l. f.	4.00	4.00	5.48
32. Furnishing and installing 4-in. diam. galvanized W.I. pipe incl. fittings, valves, specials and metal supports	160 l. f.	6.00	6.00	7.05
33. Furnishing and installing 10-in. diam. cement lined W.I. pipe incl. fittings, valves, specials and metal supports	40 l. f.	15.00	15.00	17.20
34. Galv. C.I. boxes — Type SL	350 lb.	2.00	2.00	1.80
35. ¾-in. diam. silican bronze electric tubing incl. bronze boxes and fittings in place	720 l. f.	1.50	3.00	3.75
36. 1-in. diam. silican bronze electric tubing incl. bronze boxes and fittings in place	970 l. f.	2.00	4.00	4.50
37. 1½-in. diam. silican bronze electric tubing incl. bronze boxes and fittings in place	430 l. f.	2.50	5.00	5.40
38. 2-in. diam. silican bronze electric tubing incl. bronze boxes and fittings in place	30 l. f.	4.00	6.00	6.25
39. 2-in. diam. asbestos cement conduit in place	380 l. f.	.60	1.00	1.55
40. 2½-in. diam. asbestos cement conduit in place	120 l. f.	.80	1.50	2.00
41. 3-in. diam. asbestos cement conduit in place	1,200 l. f.	1.00	1.50	1.25
42. 3½-in. diam. asbestos cement conduit in place	300 l. f.	1.20	1.50	1.85
43. 4½-in. diam. asbestos cement conduit in place	1,990 l. f.	1.60	2.00	2.10
44. 1½-in. diam. galvanized steel conduit incl. fittings in place	350 l. f.	1.00	2.00	1.85
45. 3-in. diam. galvanized steel conduit incl. fittings in place	250 l. f.	2.00	3.00	4.40
46. 3½-in. diam. galvanized steel conduit incl. fittings in place	50 l. f.	3.00	4.00	8.25
47. 4½-in. diam. galvanized steel conduit incl. fittings in place	100 l. f.	4.00	5.00	7.50
48. 5-in. diam. galvanized steel conduit incl. fittings in place	80 l. f.	5.00	6.00	12.90
49. Furnishing and installing 500 M.C.M. ground cable	150 l. f.	2.00	4.00	4.50
50. Furnishing and installing 250 M.C.M. bare ground cable	200 l. f.	1.00	2.00	2.00
51. Furnishing and installing N 4/6 ground cable	10 l. f.	1.00	10.00	20.00
52. Fender structure, incl. permanent wharf, except piles	Lump Sum	340,000.00	400,000.00	480,000.00
53. Tidal breakwater, except piles	Lump Sum	14,000.00	20,000.00	145,000.00
54. Furnishing and driving untreated white oak class B piles for permanent wharf	1,100 l. f.	3.00	3.50	1.36
55. Furnishing and driving creosoted yellow pine class A piles for fender structure	42,000 l. f.	3.00	3.50	2.60
56. Furnishing and driving creosoted yellow pine class B piles for fender structure and breakwater	4,000 l. f.	3.00	3.50	1.91
57. Furnishing and driving untreated class C piles for field office building	1,260 l. f.	3.00	3.50	2.19
58. 5 ft.-6 in. diam. foundation piers for Gov's. Is. ventilation building, in place	740 l. f.	100.00	140.00	245.00
59. Furnishing and installing miscellaneous copper	370 lb.	2.00	2.00	1.85
60. Furnishing and installing miscellaneous brass	80 lb.	2.00	2.00	1.85
61. Furnishing and installing miscellaneous bronze	70 lb.	2.00	2.00	2.45
62. Furnishing and installing miscellaneous exhaust air parts	8 each	60.00	60.00	70.00
63. Construction and maintenance of field office building	Lump Sum	15,000.00	50,000.00	136,000.00

New Aids to the Constructor

MANUFACTURERS' LATEST DEVELOPMENTS IN EQUIPMENT AND MATERIALS

SHIELDED ARC ELECTRODES—New electrode has been developed to produce machinable welds on cast iron. After machining or grinding, the weld metal deposit closely matches color of cast iron parent metal. Deposit and fusion zone of cast iron may be easily machined, ground or filed. Electrodes are manufactured in 3/32-, 1/8-, 5/32- and 3/16-in. diameter and packed in 10-lb. cartons—*Page Steel & Wire Division, American Chain & Cable Co., Inc., Monessen, Pa.*



BULLDOZER - SHOVEL — Model 9-A bulldozer shovel, built into International T-9 and TD-9 TracTractor, is dual-purpose unit and may be equipped with either full-track width 1-yd. bucket or bulldozer blade. Bucket is raised, lowered, dumped and relatched entirely by hydraulic control, eliminating practically all physical effort. Bucket tilts back automatically in carrying position preventing spillage. Catalog No. 164 gives mechanical details and specifications—*Frank G. Hough Co., Libertyville, Ill.*

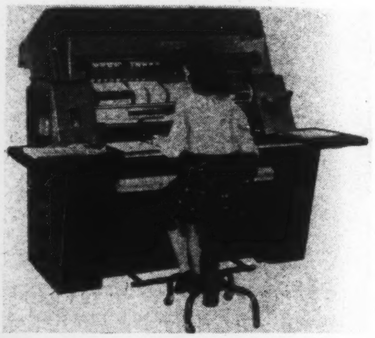
KINETIC MIXER—Portable 3-cu. ft. machine is designed to handle all types of cold asphalt mixes, including sheet asphalt and asphaltic concrete. It is claimed that new mixing principle provides thorough coating of all aggregate particles with asphalt, making possible for first time in small mixer completely successful use of chemical additives to eliminate need for drying wet aggregates. In addition to its use for patching and paving asphalt areas, mixer has been successfully employed on asphaltic floor emulsions, feeds, foods, sand, chemicals, concrete, and other construction and industrial mixes. Capacity under good conditions is as high as two batches per minute.—*Foote Co., Inc., Nunda, N. Y.*

CABLE CONTROL — Rear-mounted double drum cable control unit for use with "Caterpillar" Diesel D6 and D7 tractors, known as the No. 23, is designed to develop line pulls ample to meet service requirements imposed by operation of scrapers, bulldozers and rippers.—*Caterpillar Tractor Co., Peoria, Ill.*

PORTABLE GENERATOR—A portable gasoline-engine-driven starter-booster Homelite generator gives the high cranking speed and strong spark necessary for starting in sub-zero weather. Easily connected to the battery terminals, the full capacity of the generator plus the current from the battery are fed into the starter, making quick starts possible.

Completely self-contained, the generator can be carried to any truck or construction machine. Designed to bring the battery voltage to maximum operating efficiency in a minimum time, it can be used for quick charging as well as booster service. Generators are available in sizes to fit all types of applications. — *Homelite Corporation, Port Chester, N. Y.*

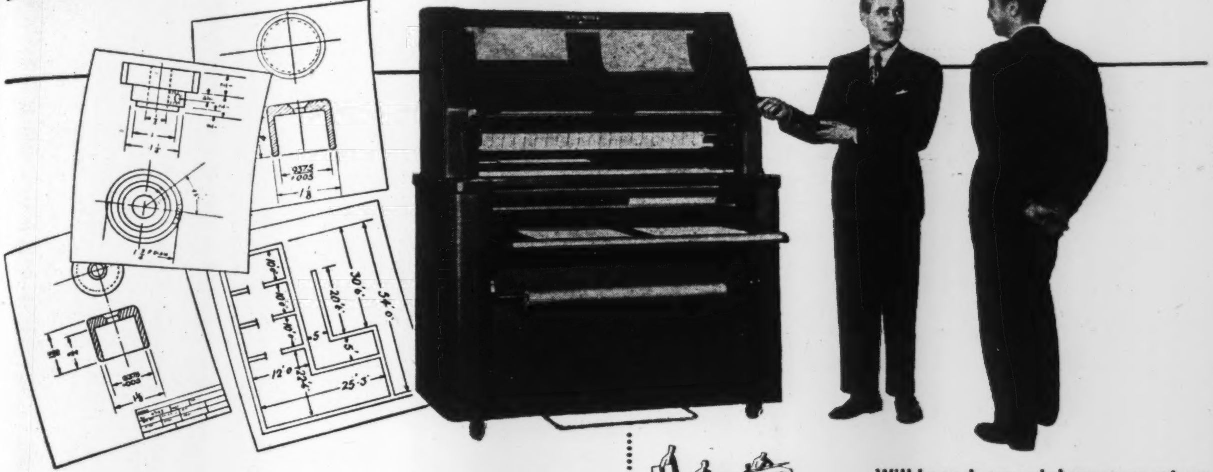
TESTING SCREEN—Mechanical testing screen is designed for efficient sizing of test samples of crushed stone, gravel, slag, and similar materials. It handles up to 1 cu. ft. of sample, making from two to seven separations simultaneously. Screen action is so adjusted, it is claimed, that separation approaches theoretical refusal point very closely even when samples contain elongated fragments and materials varying in density.—*Gilson Screen Co., P. O. Box No. 186, Mercer, Pa.*

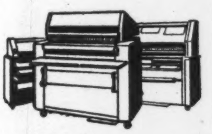


PRINTER-DEVELOPER—New and exclusive features of design speed and facilitate print production in the new Bruning Model 91 BW volumatic printer-developer. Requiring only one operator, the Volumatic is intended for large-volume production of cut sheets, and accommodates roll stock up to 42 in. wide. It prints and develops all Bruning BW mediums, including light, regular or cardweight BW paper prints. The prints are produced in volume at speeds up to 30 ft. per min.—*Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill.*

PRESSURE FILTER—The "Pur-O-Cel" water filter, now available for small water treatment plants and all swimming pools makes filtering a simple, mechanical operation. The filter utilizes thin mats of diatomaceous earth

What FACTS Should YOU Have Before Changing to Black Line Prints?





Will black line equipment meet my future print requirements, as well as my present ones?

Yes—whether you use only a few prints a day—or hundreds—there are Bruning BW Printer-Developers to meet your needs. Whatever size you choose, you get all the advantages of Bruning BW Black and White Prints—made directly from your tracings, without the use of a negative, and in *seconds.*

How can I tell which printer-developer is best for my needs?

Bruning offers you 45 years of experience in analyzing print requirements. Bruning representatives will not recommend a Printer-Developer which is larger or smaller than you need. All recommendations are based on a careful study of your individual print uses.

Since 1897

CHARLES BRUNING COMPANY, INC.

NEW YORK **CHICAGO** **LOS ANGELES**

Atlanta
Kansas City
St. Louis
Boston
Milwaukee
San Francisco
Detroit
Newark
Seattle
Houston
Pittsburgh

Will I need a special room or set-up for Bruning BW Equipment?

Not unless it seems desirable from an efficiency standpoint. Bruning BW Printer-Developers require no plumbing. There are no exhaust fumes to provide for. Bruning BW Printer-Developers can therefore be installed anywhere in your drafting or engineering department. The BW Direct Line Printing process is clean and so simple that even an inexperienced operator can make good BW Prints.

You Get These Six Major Advantages with the BRUNING BW SYSTEM

1. **A versatile, simple method for making black or colored line prints directly from transparent or translucent originals.**
2. **45 years' experience in analyzing printmaking needs.**
3. **A complete direct-line printing process, including white and green tinted papers, thin, medium and card-weight papers, black, red or brown line prints. BW Transparents and BW Film (intermediate prints) to supplement original valuable tracings.**
4. **A complete line of printing and developing machines to fit every requirement.**
5. **A continuing service . . . because Bruning sells everything for the engineer and draftsman, not just BW equipment. Buying a BW machine is, therefore, not a "one-time sale."**
6. **Continuing research and development in the customer's interest.**

CHARLES BRUNING COMPANY, INC.
4714-24 Montrose Avenue, Chicago 41, Illinois

Gentlemen: I want to know more about Bruning BW Prints and equipment. Please send me information.

Name..

Company..

Street..

City.............................*State*................

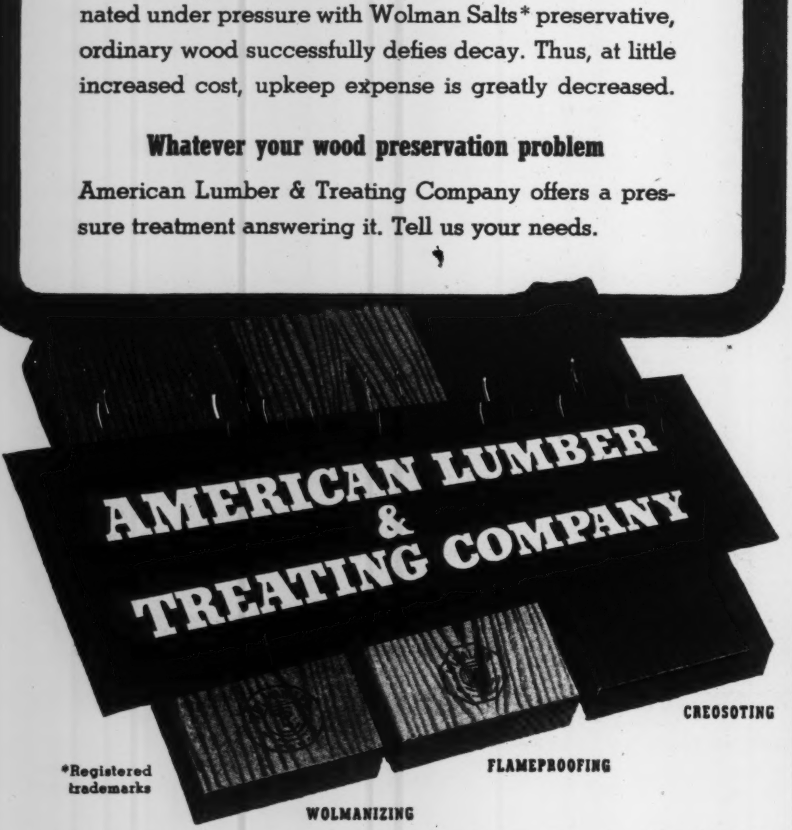
It's not the
HEAVY HAULING—

DECAY, nourished by moisture, kills wood's resistance to wear. Icing platforms made of untreated wood soon fall victim to its attack.

Wolmanized Lumber* solves this problem. Impregnated under pressure with Wolman Salts* preservative, ordinary wood successfully defies decay. Thus, at little increased cost, upkeep expense is greatly decreased.

Whatever your wood preservation problem

American Lumber & Treating Company offers a pressure treatment answering it. Tell us your needs.



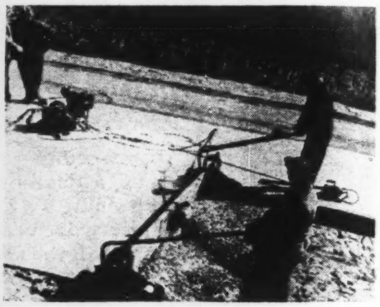
*Registered trademarks

1649 McCORMICK BUILDING CHICAGO 4, ILLINOIS

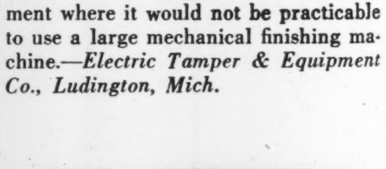
rather than a sand bed; it produces clear, brilliant water, removes all amoebic dysentery cysts and many bacteria.

Due to its compactness and rapid filtration rate, the filter is much smaller than a sand filter of the same capacity, thereby saving floor space. Backwashing for cleaning is easily accomplished without disassembling the unit and with a comparatively small volume of water —*Proportioneers, Inc., 92 Codding St., Providence 1, R. I.*

REFILL DRAWING PENCIL—A new refill drawing pencil, which eliminates two-handed screwing and turning operation, is marketed under the brand name Castell Locktite. It is designed with a clutch which opens by a simple pressure of the thumb on the button release. Holding the point to the paper, the lead may be adjusted by the upward or downward movement of the hand, eliminating the need to touch the graphite with the risk of smudging the drawing. —*A. W. Faber, Inc., Newark, N. J.*



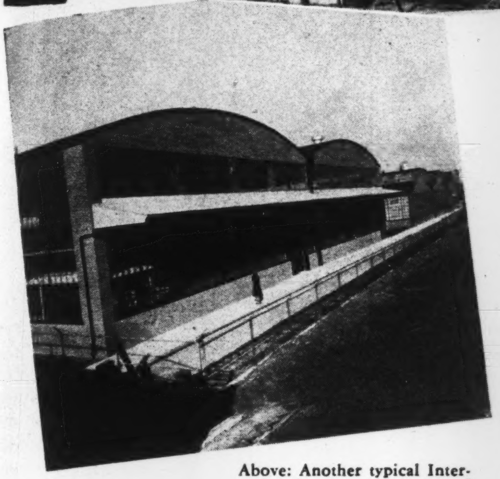
HAND SCREED—The new Model SC-200A Jackson vibratory hand screed is built to satisfy a demand for a vibratory hand screed that can be used on a variety of concrete slab surfacing operations such as floors, bridge decks, sidewalks, ramps and odd or short sections of municipal and other pavement where it would not be practicable to use a large mechanical finishing machine.—*Electric Tamper & Equipment Co., Ludington, Mich.*



CABLE-OPERATED RIPPERS—Production has started on two sizes of cable operated rippers, No. 28 and No. 18.

If it is built of steel, International is your best source of supply. For example, the steel requirements for this large Florida can manufacturing building were met efficiently and economically from International's large stocks.

gain time!
reduce costs!
insure quality!



Above: Another typical International assignment was steel for Seeger Refrigerator Company's modern Evansville plant. Below: International's extensive line of prefabricated buildings, widely used in many industries, are not only sturdy and durable, but extraordinarily easy to erect. The buildings shown here are being assembled quickly and easily by men who had no previous experience.

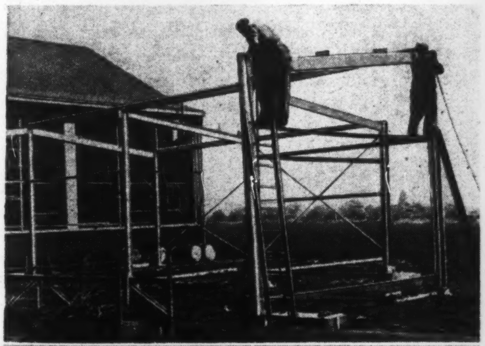
with International

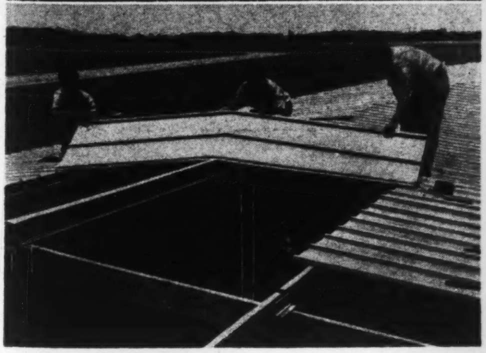
STRUCTURAL STEEL
STANDARDIZED STEEL TRUSSES
STEEL BUILDINGS

Unusual strength that is carefully engineered into its products . . . strict adherence to highest quality standards . . . constant development of new methods to provide greater economies in construction . . . alertness to changing trends and demands . . . all have entrenched International Steel Company in the favor of an increasing number of customers wherever steel is used for building.

Where International's standard items such as trusses and prefabricated building units cannot be applied to specific requirements, our complete facilities and skilled engineers are eager to assist in working out designs in steel exactly to your specifications.

Whether yours is a problem in industrial, aviation, agricultural or commercial buildings—complete jobs or structural parts—it will pay you to take advantage of International's experience. Write for complete details.



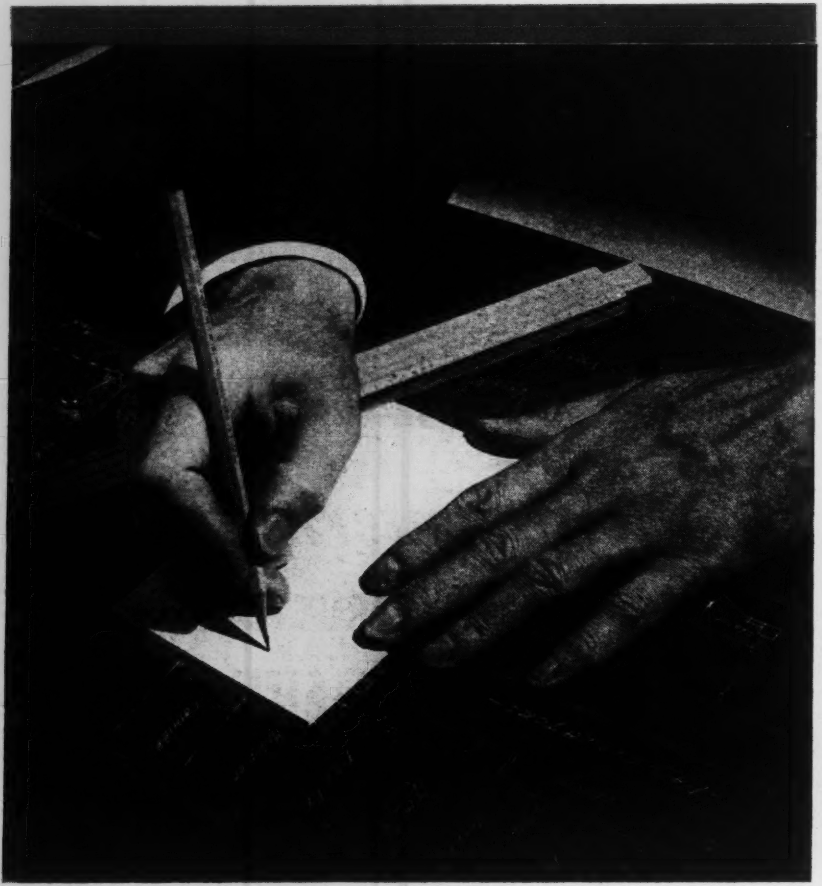


INTERNATIONAL
Steel Co.

STRUCTURAL STEEL
STEEL BUILDINGS
STEEL TRUSSES
BUILDING PRODUCTS

1519 EDGAR STREET
EVANSVILLE 7, INDIANA

ALSO MAKERS OF VAN KANNEL REVOLVING DOORS; FAIRHURST UNITFOLD PARTITIONS; HANGARS; HANGAR DOORS, AND ORNAMENTAL STEEL



Bid with Confidence

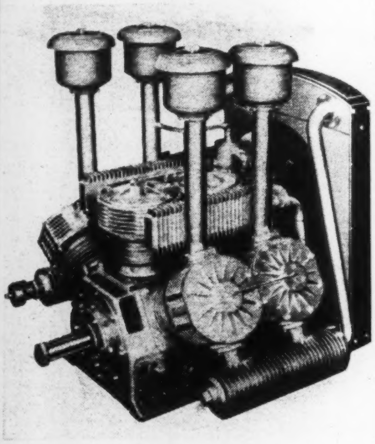
The contractor who establishes his credit with the Ætna Casualty and Surety Company is prepared to provide a Contract Bond on public or private jobs in any part of the country.

He can *bid with confidence* that his surety will be acceptable and that no matter where his work may take him, he will always have the facilities of Ætna's trained and experienced coast to coast organization near at hand.

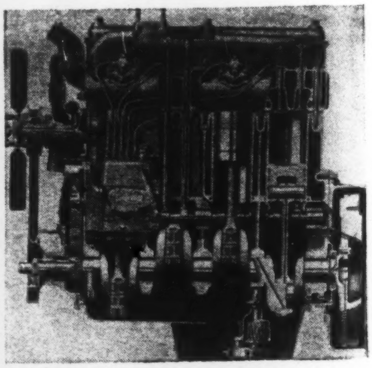
ÆTNA

ÆTNA CASUALTY AND SURETY COMPANY
Affiliated with Ætna Life Insurance Company
Automobile Insurance Company   Standard Fire Insurance Company
HARTFORD 15, CONNECTICUT

These rippers are rugged machines designed to do the tough jobs. No. 28 is built for use with one or two D8 tractors; No. 18 for use with a single D7 or D8 tractor. The rippers are operated by a rear cable control on the tractor. — *Caterpillar Tractor Co., Peoria, Ill.*



COMPRESSOR LINE—To mark the 25th anniversary of its introduction of the world's first air-cooled portable compressor, the *Davey Compressor Co., Kent, Ohio*, has announced a complete new line for 1947. It includes five models of 60—105—160—210—315 cfm. capacity. All units are of V-type cylinder design, except the Model 315. The latter is of "W" construction with four low pressure and two high pressure cylinders. Units operate at relatively slow piston speeds through the use of short piston strokes ($4\frac{1}{2}$ in. for Models 60—105; 4 in. for Models 160—210—315). Aluminum alloy compressor heads and manifolds are utilized in all models.



DIESEL POWER UNITS—Start of production on 125-hp. Model UD-18A power unit and 76-hp. Model UD-14A was recently announced. Both are heavy-duty four-cycle diesels with same bore and stroke. UD-18A has six $4\frac{3}{4}$x$6\frac{1}{2}$-

Where Minutes Add Up In Dollars—
EUCLID
. . . Slash Downtime Hours with—
FIRESTONE Tires and Project Service

GROUND GRIP
EARTH MOVER
ROCK GRIP

EVERY contractor knows how quickly minutes add up in dollars of lost profit whenever any equipment "goes down" on the job. To avoid downtime due to tire failure, many contractors are using the new Firestone combination—off-the-highway tires and on-the-project service.

Firestone Project Service is a basic and simple program which pays off in greatly increased production and extra hours of tire life.

Firestone tire service engineers will analyze your operation, recommend the tires specifically built for that type of work. They will install an inspection and maintenance schedule which will cut your tire costs to the bone. And if you wish, these engineers will assume full responsibility for the successful operation of every tire on your project.

For further details, and without obligation, write Project Service Engineering, The Firestone Tire & Rubber Company, Akron, Ohio.

Listen to the Voice of Firestone every Monday evening over NBC

Copyright, 1947, The Firestone Tire & Rubber Co.

Firestone

OFF - THE - HIGHWAY TIRES

Complete COMPACTION

can be obtained only by

HIGH SPEED *internal vibration*

NO OTHER METHOD EQUALS
THE EFFICIENCY OF **VIBER**

VIBER COMPANY

SINCE
1931

726 SO. FLOWER STREET
BURBANK, CALIFORNIA

ORIGINATORS OF INTERNAL CONCRETE VIBRATION

10

Concrete Products

you will want to know about

SULCO PRODUCTS

New methods for CONCRETE

☐ SEALING
☐ CURING
☐ COLORING
☐ HARDENING
☐ RENOVATING
☐ PAINTING
☐ PATCHING
☐ BONDING
☐ REPAIRING
☐ STAINING

Write today for complete information

Please send interesting sample and bulletins, without obligation.

NAME ....

FIRM ....

ADDRESS ....

CITY ....STATE .....

Send to—

The SULLIVAN Company
Memphis 2, Tennessee
Distributors in principal Countries

IRVING DECKING

BRIDGE FLOORING

OPEN STEEL GRID

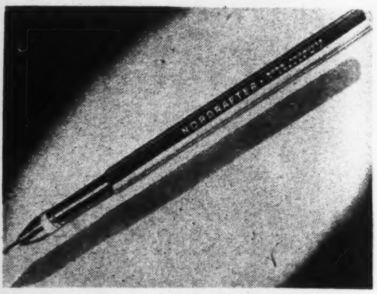
SAFETY
Permanent Inwrought Traction
Self-Cleaning Surface

LIGHTWEIGHT
Only 15¼ lbs. per sq. ft.

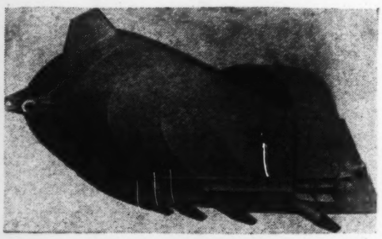
ECONOMY
Minimum Maintenance
Non-Erasible Lane Markers
Restores Old Bridges
Reduces Cost of New Bridges
May we send our catalog?

IRVING SUBWAY GRATING CO., INC.
ESTABLISHED 1902
HOME OFFICE and PLANT: 5008 27th STREET
LONG ISLAND CITY 1, NEW YORK
WESTERN DIVISION: FOOT OF PARK AVE.
EMERYVILLE 8, CALIFORNIA

in. cylinders and UD-14A has four. New cylinder head arrangement, improved nozzles, and redesigned precombustion chambers give them higher compression and greater efficiency in converting fuel energy into low-cost power. Exhaust manifold is on injection side of engine, away from intake manifold, so incoming air is kept cooler. Both units achieve their higher rpm. and increased horsepower without resort to special lubricating oils.—*Industrial Power Division, International Harvester Co.,* 180 *N. Michigan Ave., Chicago* 1. *Ill.*



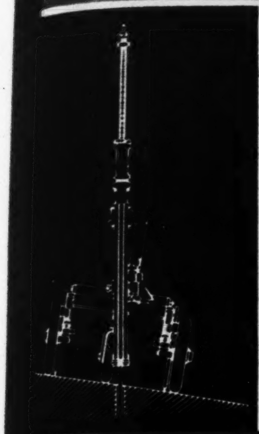
DRAFTING PENCIL—The Nordrafter pencil is a simple two-part instrument consisting of an aluminum body, with a four-jaw collet attached, and a hardened, knurled steel grip. It has perfect balance with a grip that allows a maximum of comfort and finger ease. The four-jaw collet grip gives the user positive protection against the lead either slipping or breaking.—*Nord Products, East Orange, N. J.*



LARGE SCRAPER—Largest of the Crescent scraper buckets is the new 15 cu.yd. Crescent "Mammoth," now in use for stripping, levee construction, and similar work. Because of refinements in cutting lines, and because of its reduced weight-strength ratio, scraper can be operated by a power unit scarcely larger than was required for former Crescent scrapers of 12 cu.yd. capacity.—*Sauerman Bros., Inc., 532 South Clinton St., Chicago 7, Ill.*

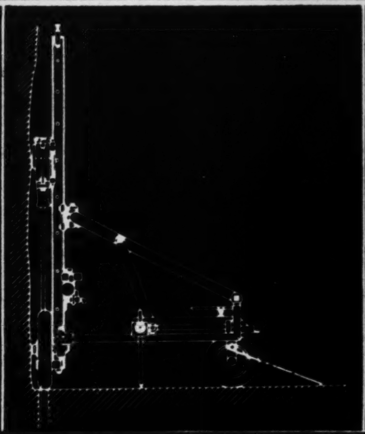
CONCRETE MIXERS—End discharge feature of 3½-S Dandie concrete mixer leaves wheelbarrow spotting area unob-

THE SULLIVAN MEDIUM WEIGHT WAGON DRILL DRILLS FAST... IS EXTREMELY ADAPTABLE



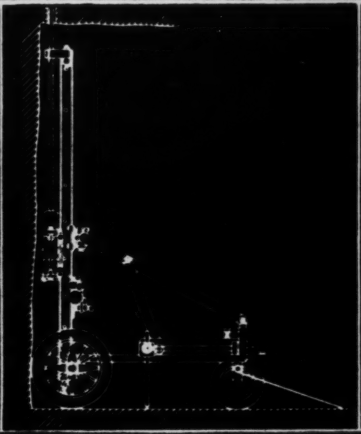
DE HILL DRILLING

tion-type, positive locking ces hold wheels securely slope drilling.



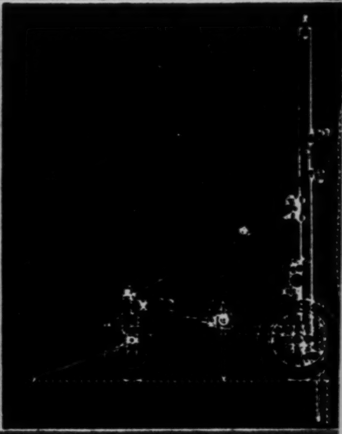
DRILLING CLOSE TO FACE

Swivel type wheels, adjustable supporting arm allow positioning within 3" of vertical face.



DRILLING UPPERS

Slide mounted "Piston-Motor" feed allows efficient drilling in tunnels of various heights.



DOWN-HOLE DRILLING

Weight of drill and feed is balanced directly over large wheels for steady drilling pressure.

WITH

SULLIVAN

LIGHT...MEDIUM...HEAVY

WAGON DRILLS

Get... MORE FOOTAGE PER SHIFT...
EASY MOVEMENT FROM HOLE TO HOLE...
QUICK SET-UPS ON EVERY JOB

PEAK AIR POWER FOR THE HARD JOBS

SULLIVAN SERIES 80 AIR COMPRESSORS
give from 60 to 630 CFM free air

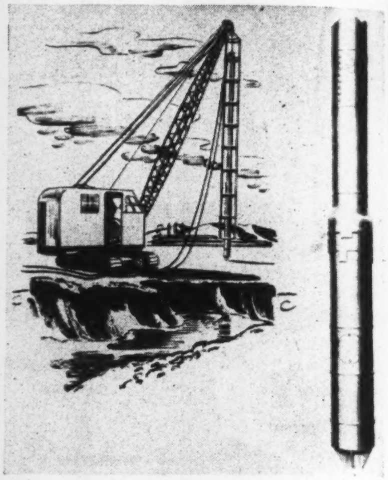
Write for bulletin or Consult a Joy Engineer

Sullivan Division

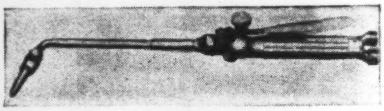
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING, PITTSBURGH, PA.

structed, eliminates turning and backing with loaded wheelbarrow. Mixer can be approached from either side or from the end. End tilter trails fast, because it rides on leaf springs. Wheels run on anti-friction bearings. Air-cooled engine won't freeze up in winter, heat up in summer.—*Kwik-Mix Co., Port Washington, Wis.*



ELECTRIC VIBRATOR COMPACTION METHOD—A new method of compacting sandy soil to increase its load-bearing capacity uses a vertical cylindrical vibrator powered by a motor especially designed by the *General Electric Co., Schenectady, N. Y.* to operate within the vibrator while it is submerged in wet sand. The huge machine, handled by a crane, compacts the soil by the combined action of a jet of water and high-speed vibration induced by the motor. Called vibro-flotation, this method diminishes the volume and permeability of soils, lessens the active soil pressure, and increases the passive soil resistance. The process is being developed by Parsons, Brinckerhoff, Hogan and Macdonald, and Merritt Chapman & Scott, both of New York City.



WELDING TORCH — Full handle length lever of Model W-46 makes it possible to shut off or release gas with only finger-tip pressure. This new feature is combined with the built-in automatic gasaver.—*Weldit, Inc., 990 Oakman Blvd., Detroit 6, Mich.*

BLADE SALVAGE—Re-Nu Edge Bar can be welded to the square or worn edge of the bulldozer, drag or maintainer blade with all purpose high-grade steel

Get **WILLSON . . .**

to Change Accident Costs into Safety Savings

PROTECTION IN 9/10 OF AN OUNCE . . . Day long comfort with the Feather Spec*. Large, clear or Willson Tru-Hue green, plastic lens gives unobstructed vision.

MOLDED TO FIT A THOUSAND EYES . . . Mirror-smooth rolled edges of the plastic eye cups conform to the contours of the eye cavities for snug, comfortable fit on hazardous jobs. With Super-Tough* lenses.

ALL 'ROUND PROTECTION—ALL 'ROUND COMFORT . . . Metal fumes; chromic acid mists; all dusts—excluded by dual, easy breathing filters and snug fitting facepiece.

For complete information on these products and their application, as well as many more eye and respiratory protective devices, get in touch with your nearest Willson distributor or write us direct.

*Trade Mark

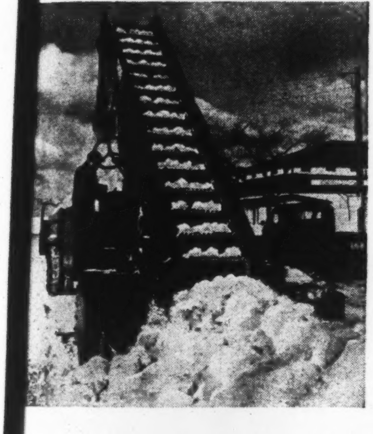
GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON

PRODUCTS INCORPORATED

100 THORN STREET, READING, PA., U. S. A.

Haiss Snow Loader reduces removal costs 51% in Ludington, Mich. (pop. 9,000)



Snows are heavy and frequent in Ludington.

Formerly, snow was removed by hand, but the City could not afford complete removal and the snow lay piled on important streets until spring. The City experimented with flushing the snow into the sewers with a fire hose, but this clogged the sewers.

In November 1945, Ludington solved its problem by buying a Haiss snow loader. For the first time, its streets could be quickly cleared for traffic—even in the heaviest snows.

James Cartier, Superintendent of Streets, takes pride in what the Haiss loader has done for Ludington and the money it has saved. "Last winter", he said, "we were all cleaned up with the loader and gone home, while nearby towns were still tied up in deep snow".

Below are Mr. Cartier's direct snow removal cost figures:

	Old Method 1944-45	Haiss Method 1945-46
Labor payroll	$4,200	$2,184
Gasoline and oil	3,077	1,634
All other expenses, repairs, etc.	1,423	459
	$8,700	$4,277

SAVING UNDER PREVIOUS YEAR: $4,423 (51 PER CENT).

Thus the direct saving for one year represents approximately 80 per cent of the loader's original cost, and Mr. Cartier's cost records show that the machine had paid for itself by March 1, 1947 (half-way through its second season).

The 18-man crew, (including six truck drivers) which formerly loaded snow by hand could handle only about 48 cubic yards per hour. The 9-man crew (including the same six truck drivers) now used with the Haiss snow loader has loaded as much as 600 cubic yards per hour.

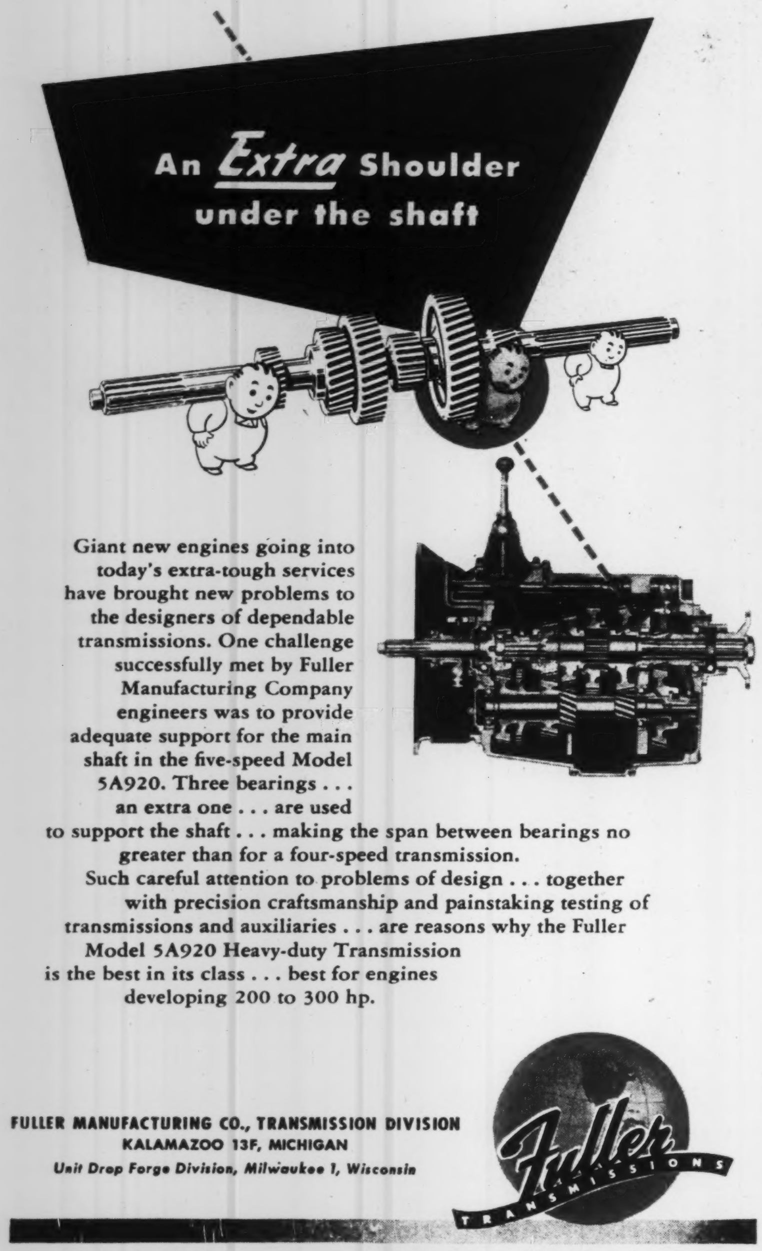
Removing snow in Ludington with the Haiss machine is quick and efficient. The snow is first plowed into windrows in the center of the streets, usually overnight. Then the loader follows quickly, picks up the windrows, and keeps the trucks rolling to the snow dump. All streets are now kept passable throughout the winter.

On January 29, 1947, Ludington had a 12-inch snow storm, with three to seven-foot drifts. The Haiss snow loader was run for 16 consecutive hours. It immediately cleaned 14 downtown blocks representing about two miles of curb. In less than 24 hours, the downtown streets were clear. The rate of loading averaged 10 cubic yards per minute.

Write for full Information on the Haiss snow loader.

* * *

GEORGE HAISS MANUFACTURING CO.
140th ST. and RIDER AVE.—NEW YORK 51, N.Y.



Giant new engines going into today's extra-tough services have brought new problems to the designers of dependable transmissions. One challenge successfully met by Fuller Manufacturing Company engineers was to provide adequate support for the main shaft in the five-speed Model 5A920. Three bearings . . . an extra one . . . are used to support the shaft . . . making the span between bearings no greater than for a four-speed transmission.

Such careful attention to problems of design . . . together with precision craftsmanship and painstaking testing of transmissions and auxiliaries . . . are reasons why the Fuller Model 5A920 Heavy-duty Transmission is the best in its class . . . best for engines developing 200 to 300 hp.

FULLER MANUFACTURING CO., TRANSMISSION DIVISION
KALAMAZOO 13F, MICHIGAN
Unit Drop Forge Division, Milwaukee 1, Wisconsin

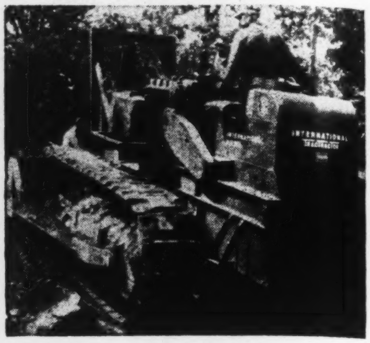
MacArthur

37 YEARS INSTALLING PILES
OF EVERY TYPE

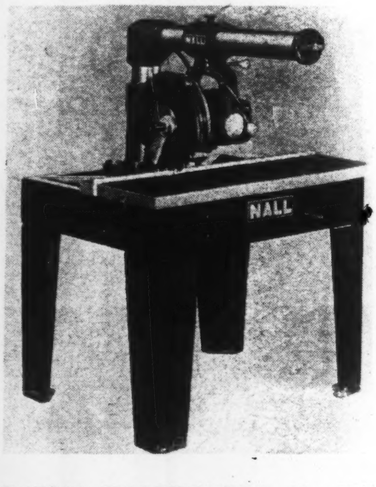
CAST-IN-PLACE
CONCRETE
COMPOSITE
STEEL
SECTIONAL PIPE
TIMBER
SOIL AND ROCK BORINGS

MacARTHUR CONCRETE PILE CORPORATION
18 EAST 48th STREET, NEW YORK 17, N. Y.
BOSTON • CINCINNATI • NEW ORLEANS

electrode, such as an AWS 6012 or 6013. To prevent wear on weld, this bead is then covered with thin layer of hard-surfacing electrode. Same material is also used around ends or corner castings where most severe wear takes place. This work-hardening steel edge will prolong life of blade many months, thereby effecting considerable savings in cost of blade replacements. *—Allied Steel Products, Inc., 7835 Broadway, Cleveland 5, Ohio.*

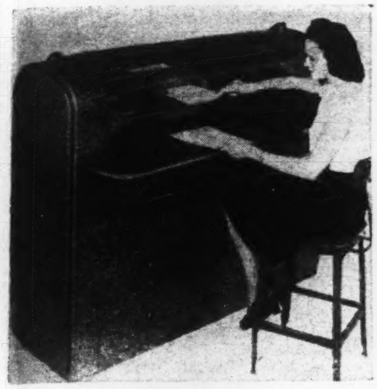


BULLDOZER — Hydraulically controlled bulldozer is precision engineered to insure rugged strength and ease of operation. Blade, which comes in different widths, has scientifically designed contour, high lift for throwing, and effective down pressure for digging. Cutting blade, which can be removed easily, is made of specially treated hard alloy steel to insure sharp cutting edge and long life. Finger-tip hydraulic controls and full visibility provide maximum ease and efficiency of operation. Blade angle can be changed to fit the job. Correct balance enables full power of tractor to be exerted on blade.*—Jaques Power Saw Co., Denison, Tex.*



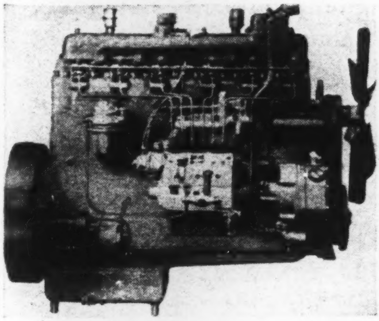
RADIAL WOODWORKER—The Nall radial woodworker is a dependable, high-production, radial arm saw, with great accuracy. It will handle any sawing operation quickly. Changes from one operation to another can be made in less than one minute.

Some of the features of the Nall are: simple operation; time saver; lightweight, rugged; frictionless carriage; new indexing and locking mechanisms; dust-sealed parts.—*Nall Equipment Engineering Co., St. Charles, Ill.*



POSITIVE PRINTING MACHINE—Streamliner can reproduce drawn, typed, printed or photographic material in 25 sec. at cost of one cent for 8½x11 in. reproduction. All controls are within easy reach of operator. Machine accommodates material up to 42 in. wide. It is wired for 220 v.,a.c., 60 cycles, single phase. Width is 62 in., height 50⅛ in., depth 31 in. and weight 745 lb.—*Ozalid, Division of General Aniline & Film Corp., Johnson City, N. Y.*

MASONRY WATERPROOFING — A guaranteed masonry waterproofing that decorates and seals out moisture in one simple operation is known as Celadri. This compound costs no more than a good grade of ordinary paint, yet will completely waterproof concrete, brick, stone, stucco and all porous masonry surfaces, inside or outside and above or below ground.—*Celadri Corp., 644 Willis Ave., Williston Park, N. Y.*



DIESEL ENGINE—New line of engines includes four sizes. Model 6-WAKD is

Dig
bigger profits
from your
tough jobs
NORTHWEST

ESCO 1½ yd. cast-welded dipper bucket on number 6 Northwest shovel, working on U.S. Reclamation Service job at Grand Coulee.

You can take the toughest digging job in stride — if you have the right equipment.

The U. S. Reclamation Service project at Grand Coulee, Washington, is a good example. Here, with water from Coulee Dam, a vast area of desert is being turned into fertile farm land. And here *ESCO* dipper buckets dig their full quota every day with the least possible maintenance and loss of time.

The tougher your job is the more you will like *ESCO* buckets. They are built to give you

FASTER DIGGING. Clean cutting front with integral tooth bases and flaring outside teeth give clean, full bite. Tapered box permits quick, complete load discharge.

GREATER PAYLOADS. Lighter weight of *ESCO* buckets allows greater payloads. Hollow arch construction and use of manganese steel for all parts subject to wear and shock reduce weight without sacrificing strength.

LONGER SERVICE. Strain is distributed evenly throughout the bucket. Manganese steel parts resist wear and shock, get harder and tougher with use.

ESCO makes two different dipper buckets. The all-cast bucket is built for extremely hard service; the cast-welded bucket is lighter in weight, and is designed for general purpose work. These are fully described in catalogs 114B and 156 which your nearest *ESCO* representative will gladly give you. Or write us direct, and you will receive them by return mail.

ESCO

MANGANESE STEEL FOR
ULTIMATE ECONOMY

ELECTRIC STEEL FOUNDRY

2167 N. W. 25th AVENUE • PORTLAND 10, OREGON

OFFICES

CHICAGO, ILLINOIS
EUGENE, OREGON
HONOLULU, T. H.
LOS ANGELES, CALIF.
NEW YORK CITY, N.Y.
SAN FRANCISCO, CALIF.
SEATTLE, WASH.
SPOKANE, WASH.

IN CANADA — ESCO LIMITED, VANCOUVER, B. C.

CONCRETE

pavement can be designed for any conditions of load and service

Concrete with its all-season strength to "take it" is the ideal pavement for roads, streets and airport runways.

Concrete pavement can be designed efficiently for any weight and volume of traffic, with neither wasteful over-design nor costly inadequacy.

Concrete pavements which are so designed, carry their traffic safely for years with a minimum of maintenance expense.

This demonstrates the basic superiority of concrete pavement, the ability to render uninterrupted service at low annual cost—the true measure of pavement economy.

Concrete pavement correctly designed, usually *costs less* than any other pavement of equal load-carrying capacity.

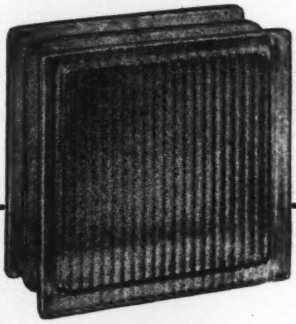
Get copy of "Concrete Pavement Design," for roads and streets carrying all classes of traffic. Sent only in U. S. and Canada.

PORTLAND CEMENT ASSOCIATION

Dept. A4c-17, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

BUY U. S. SAVINGS BONDS



Step up plant efficiency with

PC GLASS BLOCKS

Panels of PC Glass Blocks assure ample light, properly distributed. That enables workers to turn out more quality goods.

The insulating qualities of PC Glass Blocks reduce heat losses. Temperature levels are more easily maintained. Precision machines operate at maximum efficiency.

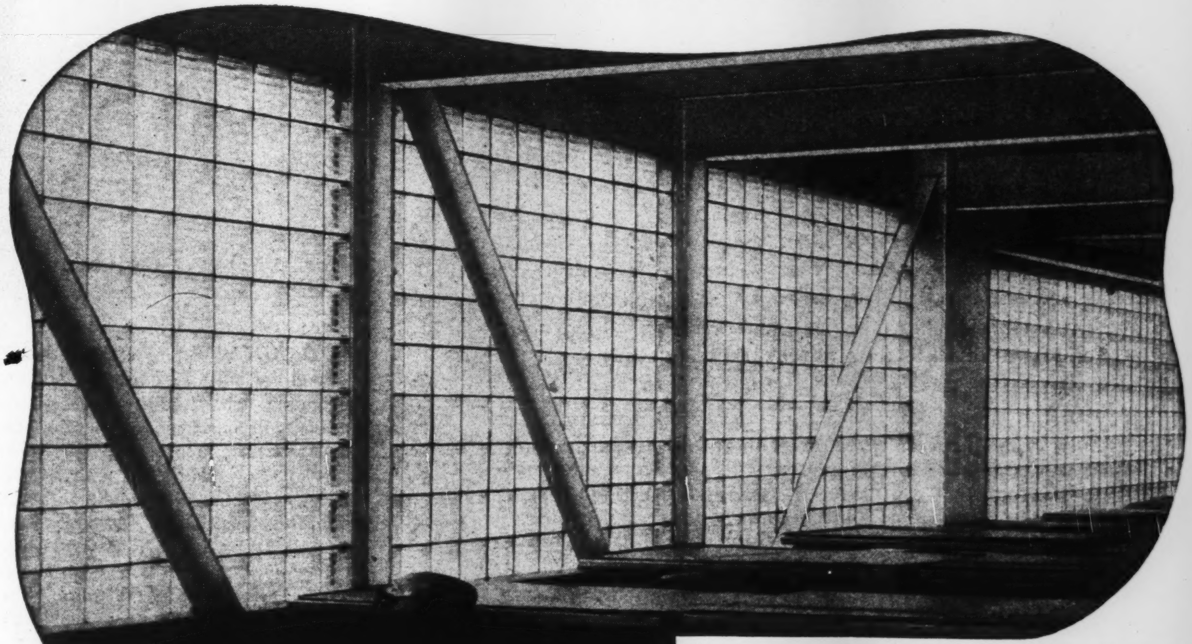
PC Glass Block panels exclude dust and grit, protect machines and goods in process from damage.

The smooth glass surfaces of PC Glass Blocks can be quickly and easily cleaned by one man with a wet brush.

These are some of the ways in which PC Glass Blocks step up plant efficiency. They also reduce operating costs, by cutting artificial lighting costs, heating costs, the costs of maintenance labor and supplies.

Plan for greater efficiency in your present plant or in new projects with PC Glass Blocks. Make sure you have full information. Send for our current book, which describes and illustrates all sorts of PC Glass Block installations in industrial plants. Pittsburgh Corning Corporation, 632 Duquesne Way, Pittsburgh 22, Pa.

· *Also Makers of PC Foamglas Insulation* ·



FOR ADDITIONAL INFORMATION SEE OUR INSERTS IN SWEET'S CATALOGS

PITTSBURGH
PC
CORNING

GLASS BLOCKS

Distributed by
PITTSBURGH PLATE GLASS COMPANY *and by W. P. Fuller & Co. on the Pacific Coast*

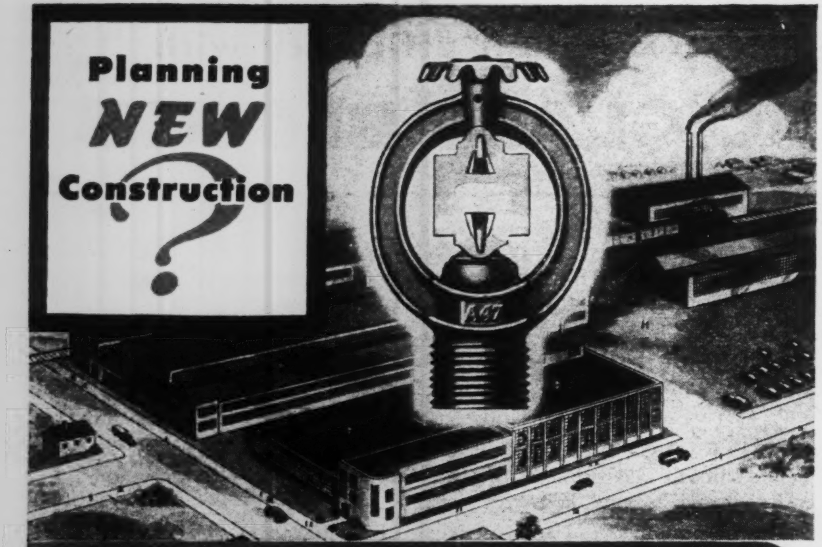
Pittsburgh Corning Corporation
Room 616, 632 Duquesne Way
Pittsburgh 22, Pa.

Please send along my free copy of your new book on the use of PC Glass Blocks for Industrial Buildings. It is understood that I incur no obligation.

Name..

Address..

City.............................. State..............



Pre PLAN your fire protection

"Automatic"
FIRE-FOG
• IT BLANKETS • IT ISOLATES • IT QUENCHES •

— a famous member of the "Automatic" Sprinkler Family. Provides adequate protection for quench tank, transformer, oil line and other fires of flammable liquid origin.

IF you're planning new construction or the remodeling of your existing facilities, adequate defense against fire must receive primary consideration. For the very structure of business enterprise is dependent upon continuity, and *fire can destroy that continuity with deliberate suddenness.*

Today's business executives are aware more than ever before of the wisdom of safeguarding lives and property. They, too, are quick to recognize the advantages of "Automatic" Sprinkler protection, industry's most effective weapon against fire . . . and this recognition did not come overnight. It is the result of more than half a century of pioneering and leadership in the design, engineering, and construction of approved fire extinguishing devices and systems which *must* and *do* meet the approval of all leading fire insurance bureaus.

- Want further information on automatic sprinkler protection? Your telephone will quickly reach an "Automatic" Sprinkler Engineer located in the principal cities of North and South America, or write "Automatic" Sprinkler Corporation of America, Youngstown 1, Ohio.

"Automatic" Sprinkler devices and systems are listed by Underwriters' Laboratories, Inc., and approved by Factory Mutual Laboratories.

FIRE PROTECTION

DEVELOPMENT ENGINEERING

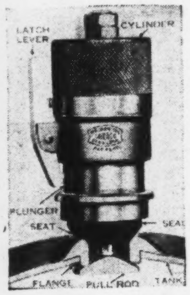
"Automatic Sprinkler"

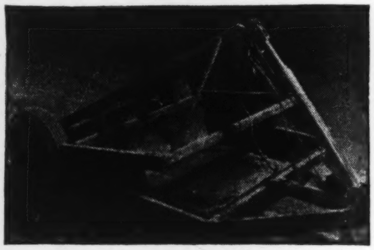
MANUFACTURE INSTALLATION

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA
YOUNGSTOWN 1, OHIO
OFFICES IN PRINCIPAL CITIES OF NORTH and SOUTH AMERICA

1,197-cu. in. six cylinder industrial engine applicable to 2-yd. shovels, draglines, hoists, mixers, crushers and similar equipment, requiring from 180 to 225 hp. Other models are 248-cu. in. tractor and industrial six and automatic six of 779-cu. in. displacement. Later, 134 cu. in. four and 201-cu. in. industrial six will be offered. Hardened crankshafts are treated by special process to give greater endurance, long life and running smoothness.—*Waukesha Motor Co., Waukesha, Wis.*

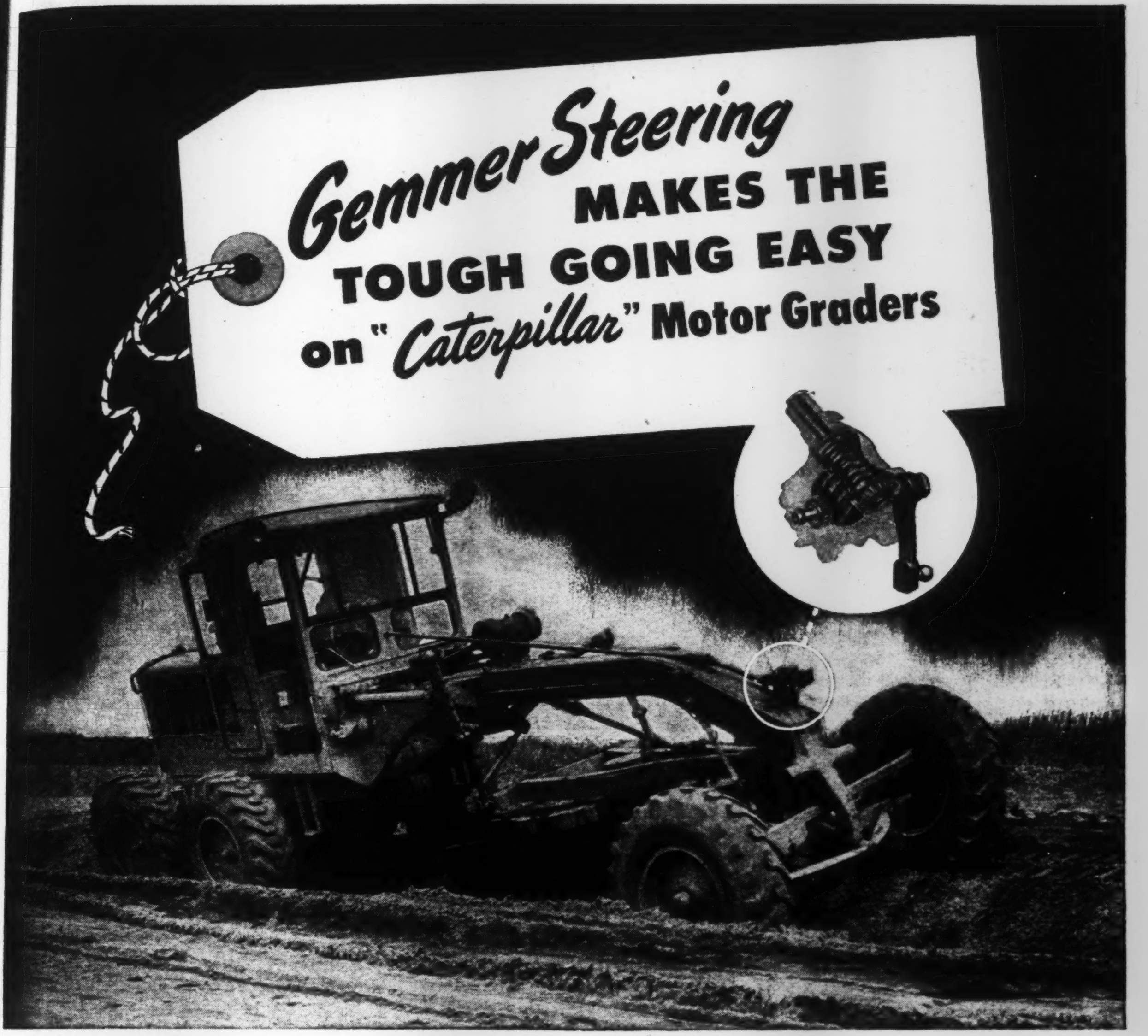
TEST PLUG—Hydro-Matic self-sealing test plug is available for standard pipe openings from ½ to 2 in. diam. They answer need for speedy and effective -means for closing openings in tanks, boilers or other vessels requiring hydrostatic or pneumatic internal pressure tests.—*Mechanical Products Corp., 168 N. Ogden Ave., Chicago 7, Ill.*





HYDRAULIC EARTH SCOOP—Designed for filling in around buildings, terracing, and grading in areas where heavy equipment cannot operate, Scoopmaster carries more than one yard of dirt at time. Equipped with hydraulic lift, it is capable of loading, hauling, dumping or spreading without making a stop. Cutting blade is designed to be tipped on end so that unit becomes grader when needed to level off and landscape areas around new buildings. —*Maquoketa Co., Maquoketa, Iowa.*

SOIL SAMPLER—For securing undisturbed soil samples in material in which it is difficult or impossible to recover them by open tube method, Cannon "Shurshot" sampler has been designed to get almost watertight shutoff. Special 32-in. long tool is designed to work on end of standard drill and to be driven by small drop hammer on drill stem to depth required. Where it



Motor Graders take the toughest going—meet the toughest steering conditions . . . wade through heavy earth . . . spread road materials . . . dig and clean out ditches . . . uproot old pavement. Travel is frequently very slow. Every condition is present to make steering difficult.

Caterpillar uses Gemmer Steering equipped with the Gemmer "Anti-Kick" in their Motor Graders. Gemmer high efficiency . . . smooth easy transfer of power make steering easy. The "Anti-Kick", non reversing feature keeps road reaction from reaching the operator through the steering wheel.

Gemmer Steering is easier, more efficient in any vehicle, from slow moving off the road types to high speed highway classifications. Gemmer Steering is dependable—lasts the life of the vehicle with reasonable care.

3020

CATERPILLAR TRACTOR CO
PEORIA ILL

TO
GEMMER MANUFACTURING COMPANY
IN APPRECIATION OF SERVICE
TO "CATERPILLAR" SINCE
1938

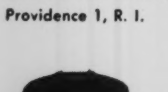
GEMMER
MANUFACTURING COMPANY

6400 MT. ELLIOTT ★ DETROIT 11, MICHIGAN

COMPLETE
INSTRUMENTATION
Vitally Important

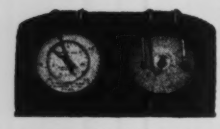
Erie, Pa., Filter Plant with Builders Gauges

Precise controls and complete instrumentation are as necessary to a modern water works as to airlines—guarding a community's health and protecting lives. For safe, efficient operation every water works plant must be adequately equipped with instruments. Builders Gauges tell the complete story of plant operation. They indicate and record loss of head, rate of flow, water level, sand expansion, etc., and are styled to harmonize attractively with the architectural design of the modern plant: For Bulletin 329A, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 51 Codding St., Providence 1, R. I.



Model GA1-R Gauge recording loss of head, rate of flow or water level.

Single dial gauge mounted on matching floor stand; stand also available for double dial gauges.



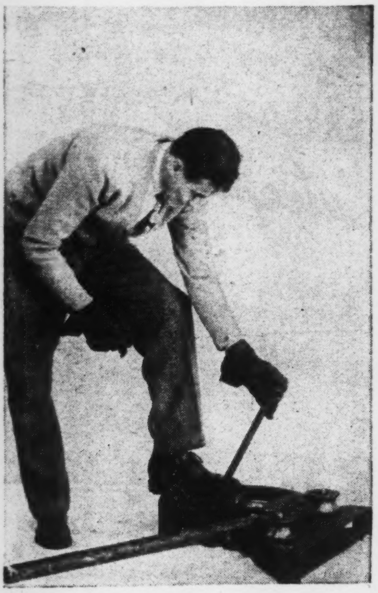
Model GA82-IR Gauge indicating and recording loss of head and rate of flow.

BUILDERS PRODUCTS

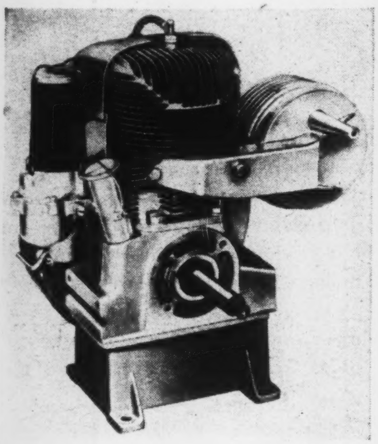
Venturi, Propeloflo and Orifice Meters • Type M and Flo-Watch Instruments • Venturi Filter Controllers and Gauges • Master Controllers • Wheeler Filter Bottoms • Filter Operating Tables • Kennison Nozzles • Manometers • Chronoflo Telemeters • Conveyoflo Meters

BUILDERS-PROVIDENCE
Instruments

is desired to take sample, drill stem is rotated with wrench to force closing of spring at lower part of unit to hold intact sample.—*Cannon Diamond Drilling Co., P.O. Box 549, Compton, Calif.*



HYDRAULIC PIPE BENDER—Power for this portable hydraulic pipe and rod bender can be provided by any make auto jack of 8-ton capacity or more. Stock size frame is for pipe bending up to 2 in. and rod bending up to 1¼ in. —*E. R. Wengenroth,* 1372 *River Rd., West Englewood, N. J.*



GASOLINE ENGINES—Four models of two-cycle engines from 2½ to 4-hp. are designated as Series 1200. Advantages claimed are: Exceptionally light weight; superior starting and idling characteristics; compact size; adaptability for additional applications; and simplicity.—*McCulloch Motors Corp.,* 6101 *W. Century Blvd., Los Angeles* 45, *Calif.*

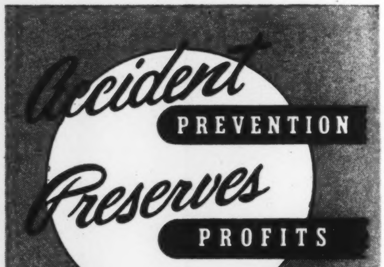
Melts Faster
Saves More Fuel
Easiest to Clean

SPEED-MASTER
KETTLE for TAR—ASPHALT
BITUMINOUS COMPOUNDS

Also ask about
Compound Melting Furnaces
Asphalt Surface Heaters
Concrete Heaters
Steam Generators
Torch Burners
Rivet Forges

Immediate delivery on the best producing oil-burning kettle—40, 55, 80, 115, 165 gal. capacities—on skids, on pneumatic tires or steel wheels. Also with hand or power spray attachments for distributing hot bitumen. Write for catalog No. 661

HAUCK MANUFACTURING CO.
150-160 Tenth St. Brooklyn 15, N. Y.



Strauss Safety Belts give that positive protection that *keeps* men on the job.

Strauss belts are constructed of selected materials, expertly assembled by men who have been making Safety Belts for industry for over fifteen years.

Strauss belts mean Accident Prevention and Accident Prevention means lower compensation payments—lower insurance costs. Write for full information. *A Strauss Safety Belt Has Never Been Known To Fail.*

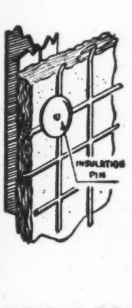
PORTABLE SAFETY DIVISION
Portable Products Corporation
420 Blvd. of Allies, Pittsburgh 19, Pa.

The "Gun" that helped get a better house to market faster, at lower cost...

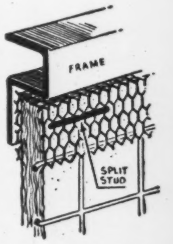
THE PROBLEM...

The Byrne Organization developed a fine steel-framed, fully-insulated house designed for efficient production. Applying collateral materials (metal lath, Fiberglas insulation, stucco reinforcement mesh) to the jig-welded wall panels by usual methods proved slow and costly. A better, faster method was needed in order to get this quality home to market in quantity, at reasonable cost.

THE SOLUTION...



Nelson Automatic Stud Welding provided a "trigger-quick" solution. The Fiberglas insulating board and wire-reinforced building paper used under the exterior stucco is secured with Nelson large-headed insulation pins "shot" through to the steel frames as illustrated in sketch at right. Nelson split studs are welded at intervals along wall ends, top and bottom plates, window and door casings.



Pre-cut sections of vapor-seal and metal lath are impaled over the pins. Fiberglas board is impaled, the metal-lath bent around it and secured by bending the pin prongs as shown in sketch above.

THE RESULTS...

In a test run with former methods, it took 4 men and a superintendent a full day to complete a wall panel. With Nelson stud welding, four men and a stud gun operator did the job in 2 hours!

★ FACTS ABOUT NELSON STUD WELDING ★

The 5-lb. Nelson "gun" is completely automatic in operation, and can be powered by any suitable portable or stationary d.c. welding generator. It arc welds Nelson flux-filled studs from 1/8" through 3/4" in diameter, up to 8" long, in *any* position. No special skill or training is required to operate this "tool of the trade"; operators average 100 to 200 stud welds per hour.

Present Nelson applications on steel construction include the securing of corrugated asbestos or metal roofing and siding, piping, conduit, sprinkler hangers, all types of insulation, metal lath and most collateral materials.

YOUR COPY'S WAITING!

The New 1947 Nelson Catalog and Data Book fully describes automatic stud welding equipment, studs, design factors and scores of specific applications. Your copy's waiting—write for it *NOW!*

NELSON SALES CORPORATION
2715 Toledo Avenue, LORAIN, OHIO
Representing: NELSON STUD WELDING CORPORATION, Lorain, Ohio • NELSON SPECIALTY WELDING EQUIPMENT CORPORATION, San Leandro, Calif.

NELSON
TRADEMARK

Worthington-Ransome Blue Brute Distributors

See ad on page 237 for list of equipment in each line

Worthington-Ransome Distributors

Ala., Birmingham, Construction Equipment Co.
  Montgomery, Burford-Toothaker Tractor Co.
Alaska, Anchorage, Airport Mach. & Storage Co
Ariz., Phoenix, Lee Redman Equipment Co.
Ark., Fort Smith, R. A. Young & Son
  Little Rock, R. A. Young & Son
Cal., L. A. Golden State Equip. Co.
  San Francisco, Coast Equip. Co.
Colo., Denver, Power Equipment Co.
Conn., Wallingford, Wilhelm-Davies Co., Inc.
Fla., Gainsville, Constr. Equip. & Supply Co., Inc.
  Orlando, Highway Equipment and Supply Co.
  Tampa, Epperson & Company
Ga., Atlanta, Tractor & Machinery Company
Ida., Boise, Olson Manufacturing Co.
Ill., Chicago, Chicago Construction Equip. Co.
Ill., Chicago, Thomas Hoist Co.
Iowa, Cedar Rapids, McNall Mach. & Supply Corp.
Ill., Chicago, J. A. Roche
Ky., Harlan, Croushorn Equip. & Supply Co.
  Louisville, Williams Tractor Co.
Maine, Portland, Maine Truck-Tractor Co.
Mich., Muskegon, Lakeshore Machy. & Supply Co
Minn., Minneapolis, Phillippi-Murphy Equip. Co.
Miss., Jackson, Jackson Road Equip. Co.
Mo., Clayton, The Howard Corporation
Mo., Kansas City, Machinery & Supplies Co., Inc.
  St. Louis, W. H. Reaves
Montana, Billings, Interstate Truck & Equip. Co.
  Helena, Caird Eng. Works
Nevada, Elko, C. W. Paul Hardware
N. J., No. Bergen, American Air Comp. Corp.
N. M., Albuquerque, Bud Fisher Co.
  Roswell, Smith Machy. Co.
N. Y., Albany, Milton-Hale Machinery Co.
  New York, Hodge & Hammond, Inc.
  New York Railroad Materials Corp.
  Syracuse, Milton-Hale Mach. Co.
N. C., Raleigh, Smith Equip. Co.
N. D., Fargo, Smith Commercial Body Works, Inc
Ohio, Cincinnati, Carroll-Edwards & Co.
Dayton, Carroll Edwards & Co.
Oregon, Portland Andrews Machinery
Pa., Wilkes-Barre, Ensminger & Co.
  Mechanicsburg, American Equip. Corp.
  Philadelphia, Metalweld, Inc.
S. C., Columbia, Smith Equipment Co.
Tenn., Knoxville, Dempster Bros., Inc.
  Memphis, Independent Tractor Co.
  Nashville, Dempster Bros., Inc.
Tex., Amarillo, T. W. Carpenter Equip. Co.
  Dallas, Shaw Equip. Co.
  San Antonio, Patten Machy. Co.
  Tyler, D. M. McClure Equip. Co.
Utah, Salt Lake City, J. K. Wheeler Mach. Co.
Vt., Barre, A. M. Flanders, Inc.
Wash., Spokane, Andrews Equip. Service
Va., Richmond, Highway Machy. and Supply Co.
W. Va., South Charleston, Allied Equip. Co.
Wisc., Milwaukee, Drott Tractor Co., Inc.

Ransome Distributors

Ark., Fort Smith, Central Welding Equip. Co.
D. C., Washington, M. A., Doetsch Mach Co.
La., New Orleans, Ole K. Olson Co.
Md., Baltimore, Stuart M. Christhilf & Co.
Mich., Detroit, T. G. Abrams
Mich., Detroit, Welding Equip. & Supply Co.
N. Y., Buffalo, Murray Equip. Co.
N. Y., Rochester, B-G Equip. Co.
Pa., Pittsburgh, Arrow Supply Company
O., Cleveland, H. B. Fuller Equip. Co.

Worthington Distributors

Ind., Indianapolis, Reid-Holcomb Company
La., New Orleans, Wm. F. Surgi Equip. Co.
Md., Baltimore, D. C. Elphinstone, Inc.
Mass., Cambridge, Field Mach. Company
Mich., Detroit, W. H. Anderson Co., Inc.
  Flint, Gransden-Hall & Co.
N. Y., Buffalo, Dow & Co., Inc.
  New York, Air Compressor Rental and Sales
O., Cleveland, Gibson-Stewart Co.
  Toledo, The Kilcorse Mach. Co.
Pa., Allentown, H. N. Crowder, Jr., Inc.
  Pittsburgh, Atlas Equip. Corp.
Texas, El Paso, Equip. Supply Co.
Washington, Seattle, Star Machinery Co.
Wyoming, Cheyenne, Wilson Equip. & Supply Co.

Worthington Pump and Machinery Corp
Worthington-Ransome Construction Equipment Division
Holyoke, Massachusetts

MEN AND JOBS

Col. J. R. Hardin

Col. John R. Hardin, who for the last year has served as deputy to the president, Mississippi River Commission, and to the division engineer, lower Mississippi Valley Division, at Vicksburg, has been assigned district engineer of the New Orleans District, Corps of Engineers. He replaces **Col. L. B. Gallagher,** who has been relieved for an overseas assignment.

Colonel Hardin was graduated from the U. S. Military Academy in 1918 and was commissioned in the Corps of Engineers. After a period in Europe as an observer and with Engineer troops, he entered Massachusetts Institute of Technology and was graduated in 1921 with a degree of bachelor of science in civil engineering.

His assignments between wars included four years in charge of construction of the spillway and main control gates at Fort Peck Dam.

In January, 1942, when the Chief of Engineers became responsible for all Army construction, Colonel Hardin became executive officer for the construction division, and in April, 1943, he was assigned as deputy chief engineer in the European Theater, where he had a large part in the construction program in the United Kingdom for providing the air bases, cantonments and other facilities for American troops, as well as advance planning for construction operations on the continent.

S. J. Norris, city engineer for Oroville, Calif., for 36 years, will resign to take charge of engineering for construction of a dam and reservoir for the Oroville-Wyandotte Irrigation District. He supervised the building of the main dam and reservoir at Lost Creek, in 1917.

John Cherry has become structural engineer for Floyd G. Browne & Associates, consulting engineers, Marion, Ohio. He served with the U. S. Army, Corps of Engineers, in the Southwest Pacific.

J. P. Farrow is structural engineer with the Texas division of the Dow Chemical Co. at Houston. He is a Texas A & M College graduate of 1946 with a B.S. degree in civil engineering and recently was a civil engineer with the U. S. Engineers Office at Galveston.

Ward McFarland, veteran of both the Army and Navy in World War II, has been appointed Alabama state highway director by Gov. James E. Folsom.

Tim de Jong, returned war veteran and prewar county surveyor, has been named Clatsop County engineer at Astoria, Ore., to replace Arthur Danielson.

Paul F. Little, formerly city engineer of Lamar, Colo., has resigned and has been succeeded by **George H. Russell.** He is now survey party chief for W. C. Krueger Co., architect-engineer, of Santa Fe, N. M. His former connections included U. S. Engineer Department, Rock Island, Ill., on flood control and hydraulic studies; Illinois Division of Highways, Dixon, Ill., on highway construction; U. S. Engineer Department, Albuquerque, N. M., on Army camp construction, earth fill at John Martin Dam and flood control studies on the Rio Grande and the Pecos and Arkansas rivers.

R. D. Mahan has started as engineering aide 2 with the Illinois Department of Aeronautics, Springfield. He was recently graduated from the University of Illinois in civil engineering.

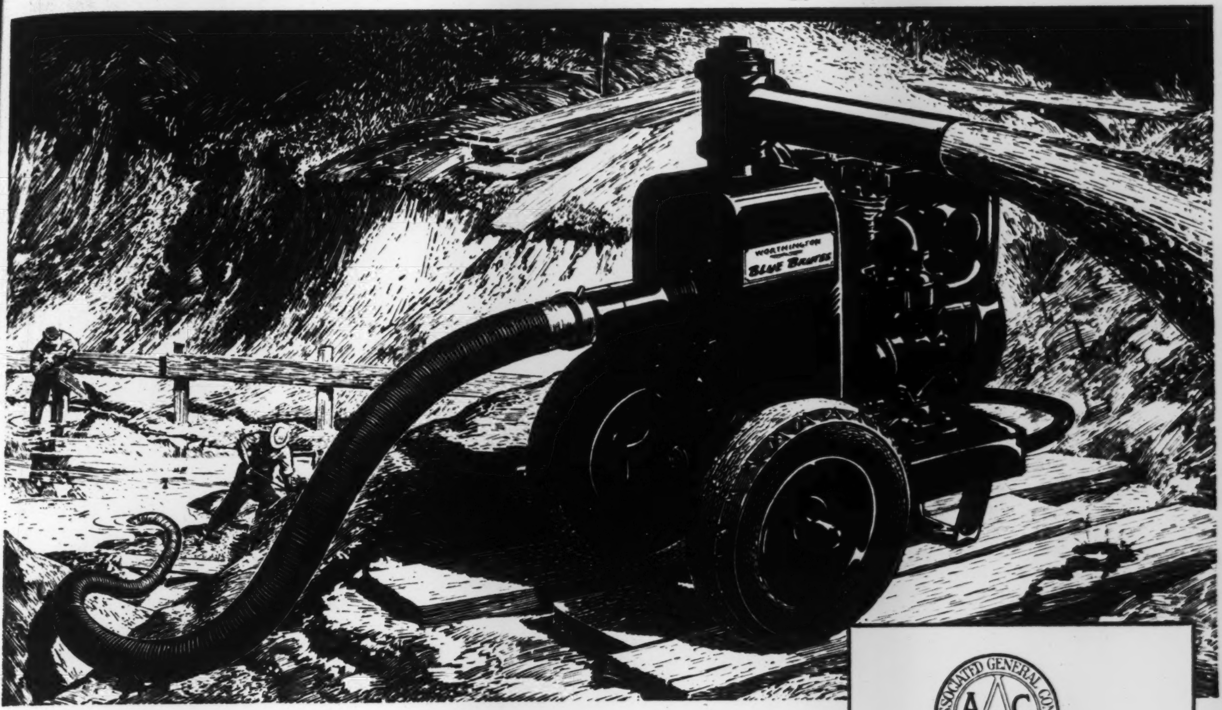
Cabell B. Owens

Cabell B Owens, formerly district engineer of the Kentucky State Highway Department, has been promoted to director of the department's division of construction, with headquarters at Frankfort. He succeeds **Glenn R. Logue,** who resigned to become chief engineer of bridges, Ohio Department of Highways, Columbus.

Mr. Owen, who has been with the Kentucky State Highway Department for 20 years, is a civil engineering graduate of the University of Kentucky, 1931. Mr. Logue was graduated in civil engineering from Ohio State University, in 1913. He formerly served with the Ohio Department of Highways for some 15 years as chief engineer of bridges, chief engineer of location and design, and assistant director and chief engineer.

Percy M. Othus has been appointed special assistant to Col. O. E. Walsh, Portland, Ore., district engineer, in charge of the Willamette Valley basin

NOW... A CONTRACTOR'S PUMP BY WORTHINGTON



Meet the Blue Brute Portable Self-Priming Centrifugal Pump, newest development of Worthington's 100-years-plus of experience in the design and manufacture of pumps. Fabricated of rust and abrasion-resisting alloy steel, it is ruggedly built to take the hardest knocks, yet light in weight for easy portability.

Fast, unfailing self-priming is a built-in feature of its advanced hydraulic design — not a troublesome auxiliary device. There is no priming valve to get out of order, none of the usual "recirculation" that reduces capacity or efficiency. The result is quick, dependable pick-up of water at all times.

Thoroughly tested in the modern research laboratories of the world's largest builder of pumps, this latest addition to the famous Blue Brute Construction Equipment line is a compact, streamlined portable pumping unit — in which simplicity of design and sturdiness of construction provide top performance under severest operating conditions . . . further proof that *there's more worth in Worthington-Ransome.*

For additional information on Blue Brute Portable Self-Priming Centrifugal Pumps, see your nearby Worthington Distributor. Or, write for Bulletin W-2010-B2.

H6-25

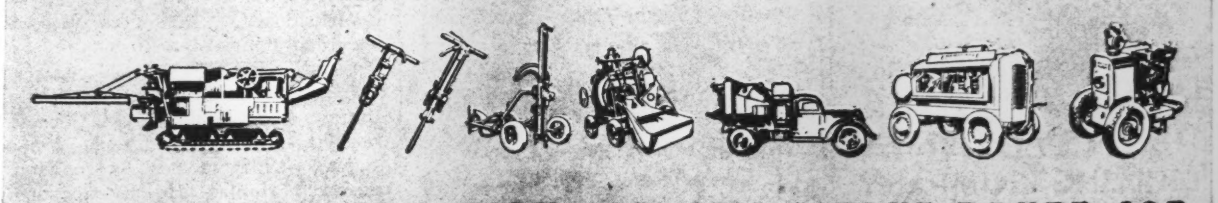
Blue Brute Pumps are built to the standards of the Associated General Contractors of America, Inc., and carry the **A.G.C.** rating plates.

Your Blue Brute Distributor will gladly show you how Worthington-Ransome construction equipment will put your planning on a profitable basis. His name is listed on page 236.

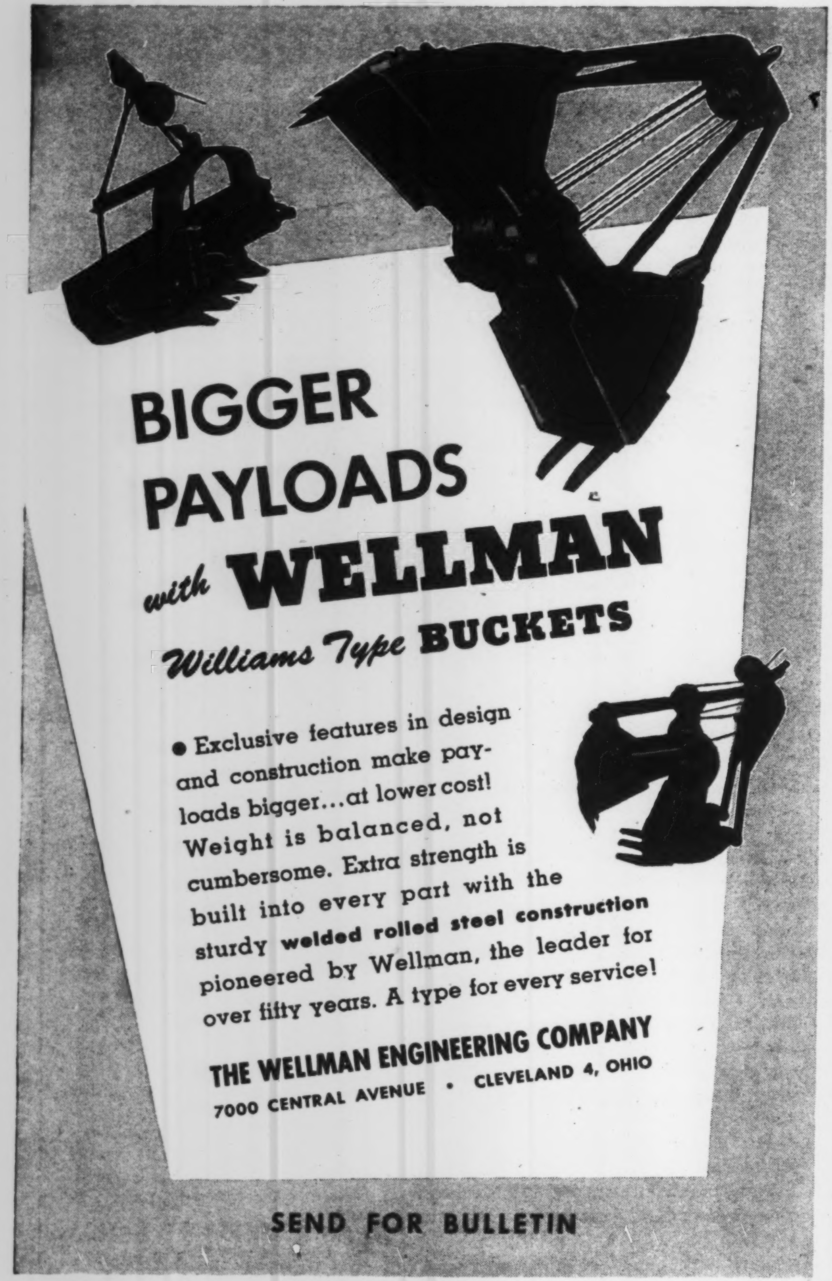
WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass.

BUY BLUE BRUTES



IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB


BIGGER PAYLOADS with WELLMAN Williams Type BUCKETS

● Exclusive features in design and construction make payloads bigger...at lower cost! Weight is balanced, not cumbersome. Extra strength is built into every part with the sturdy **welded rolled steel construction** pioneered by Wellman, the leader for over fifty years. A type for every service!

THE WELLMAN ENGINEERING COMPANY
7000 CENTRAL AVENUE • CLEVELAND 4, OHIO

SEND FOR BULLETIN

DRILLING
ANYWHERE

We look
into
the earth

PENNSYLVANIA
DRILLING COMPANY
PITTSBURGH, PA.

LEWIS & McDOWELL Inc.

Engineers & Contractors

GUNITE work in all its Branches
Prestressed Gunite Tanks
Waterproofing, all types
Restoration of Masonry Buildings
Synthetic Rubber and other special Tank Lining
Dam Repairs and Reconstruction

285 Madison Avenue, New York, N. Y.
Murray Hill 3-0554

flood control design and construction. Former assistant chief of the district engineering division, he recently returned from China, where he was loaned last May to Morrison-Knudsen Co. as executive engineer for the Yellow River consulting board.

Thomas M. Basterash, consulting engineer and city engineer for Superior, Wis., from 1935 to 1941, has been appointed to fill the newly-created position of city building inspector.

Leo Kurt recently joined Charles Macklin in the firm formerly known as Macklin and Thunman, 124 No. Fifth St., Springfield, Ill. **Carl Thunman** has left to take a position with the Alzina Construction Co., as general carpenters' superintendent for construction work at the municipal power plant at Lake Springfield.

Ernest L. Boggus has opened his own business as civil engineer and surveyor at Atlanta, Ga., offices at 75 1-2 Hunter St. He has been in the engineering field 18 years. He was at one time employed by the U. S. Geological Survey, General Land Office, U. S. Resettlement Administration.

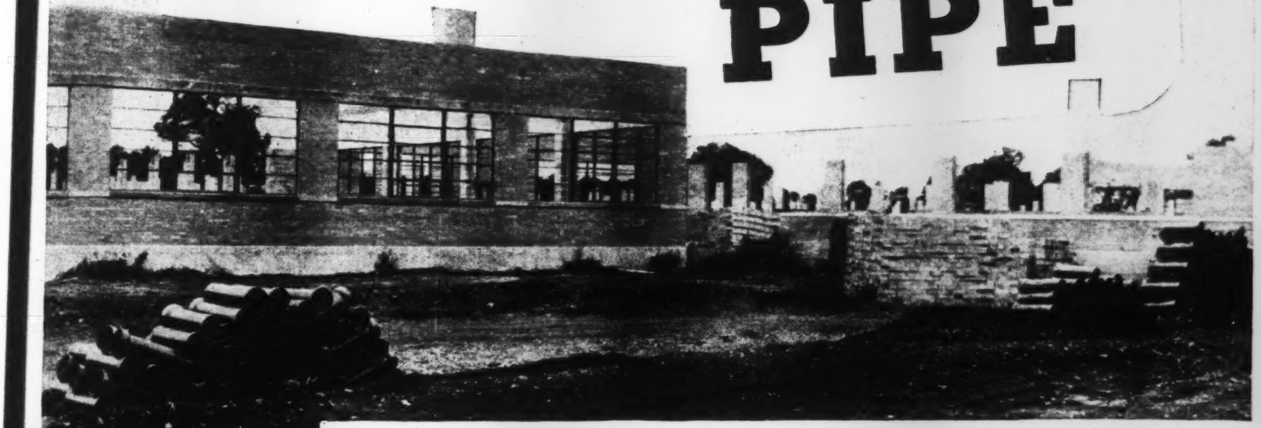
Robert E. Tobin, formerly instructor in civil engineering at Gonzaga University, Spokane, Wash., has been appointed district engineer at Spokane for the Portland Cement Association. He succeeds Pat Newlands. Mr. Tobin was graduated from the University of Wyoming with honors in civil engineering, following which he studied at Iowa State College under a fellowship for research work on concrete slabs and received a Master of Science degree. He had been at Gonzaga since 1940.

James M. Sprouse has joined the national staff of the Associated General Contractors in its Washington, D. C., offices. Mr. Sprouse, a former lieutenant (j.g.) in the Navy Civil Engineer Corps, commanded an underwater demolition team in the European theater of operations and served with the Office of Strategic Services in the Far East. He attended the Virginia Polytechnic Institute.

Robert C. Wilson has been elected chairman of the board of the Turner Construction Co., New York, succeeding Admiral Ben Moreell.

Harvey W. L. Doane recently of the Halifax, N. S., Public Service Commission, has been approved manager and director of the Standard Paving Maritime, Ltd. Halifax. He has supervised the construction of 200 miles of paving in Nova Scotia and Prince Edward

INDUSTRY PLANS AHEAD *with* CLAY PIPE



BESIDES helping to speed construction in today's booming industrial expansion, Clay Pipe is one of the most important factors in guarding against future plant obsolescence. Today's new factory may change over in a few years to metal pickling, chemical processing or some other manufacturing activity requiring the disposal of strong acid wastes. Where Clay Pipe is specified, such a change will cause no disposal system difficulties. Clay is the *only* pipe that can safely carry all industrial wastes and sewage without decomposing, corroding or rusting. It is the one pipe that is both chemical and abrasion-proof. It always pays to specify *"Clay"* . . . the pipe you can put down to *stay!*

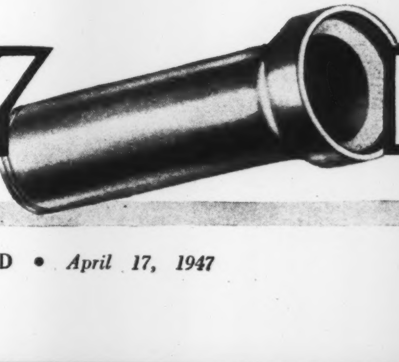
For information on your Clay Pipe problem, write to the closest regional office listed below.

NATIONAL CLAY PIPE MANUFACTURERS, INC.

571 Chamber of Commerce Bldg., Los Angeles 15, Calif.
522 First National Bank Bldg., Atlanta 3, Ga.
1105 Huntington Bank Bldg., Columbus 15, Ohio
111 W. Washington St., Chicago 2, Ill.

CLAY PIPE
NEVER WEARS OUT!

CLAY



PIPE

C-447-1

VERSATILITY
Plus MOBILITY

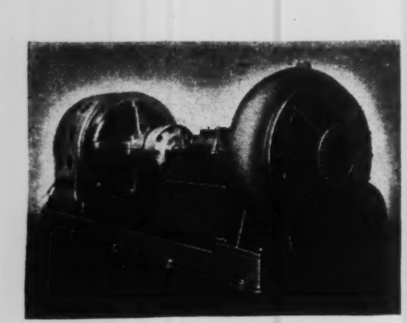
This **MORRIS**

HYDRAULIC CUTTER DREDGE

has proved its worth on

3 different deposits*

in 3 different locations...



* 1. (near Chicago) production of heavy sand and gravel, delivering through approximately 1500′ of 12″ discharge line against a 30′ static discharge head. Used until deposit was exhausted.

2. (Mississippi River) dredging for locks and dams. Used until work was completed.

3. (Albert Lea, Minn.) A lake improvement project, moving 500,000 cu. yds. of mud, clay, sand and gravel through 12″ discharge lines up to 3500′ in length. Used for 7 months.

4. (Portland, Ore.) Has completed its fourth job dredging Roslyn Lake at foot of Mt. Hood, Ore.

Assembled, dismantled and moved overland 3 different times—for dredging jobs on 3 difficult deposits—the *Captain George*, a Morris 12″ portable hydraulic cutter dredge has proved both its versatility and its mobility . . . demonstrating again that Morris dredges are engineered with two ends in view:—

1. **MAXIMUM OUTPUT** through getting the maximum amount of solids into the pump at a uniform rate.
2. **MAXIMUM LIFE** with a reasonable and economical wear of all parts.

Both require an efficient and correctly designed cutter operating at a proper speed, a properly laid out suction pipe arrangement, and an efficient dredge hoist that is simple in operation and capable of operating the cutter ladder and swinging the dredge quickly and accurately. The *Captain George* is an outstanding example of just such an efficient and well-balanced machine.

Write for Special Bulletin 144 giving specifications, cost-estimate data and recommendations on hydraulic dredging plants.

MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Branch Offices in Principal Cities

MORRIS CENTRIFUGAL PUMPS

Island, and has built airports and many water and sewerage systems in the Maritime provinces.

Lt. Col. Loren W. Olmstead has been appointed assistant executive officer of the Omaha District Engineer office. He recently received a commission in the regular Army, but has been associated with the Corps of Engineers as a civilian engineer for 13 years. He has been serving as executive officer to the Antilles Division with headquarters at San Juan, Puerto Rico.

Patrick J. Towle, St. Paul, Minn., has been appointed assistant state director of the Federal Housing Administration in Minnesota.

A. G. Murphy, formerly assistant chief engineer for the National Harbors Board of Canada, has been appointed manager of the port of Montreal. He is an engineering graduate of McGill University.

Col. A. B. Jones, Duluth, Minn., Army engineer from 1935 to 1938, and former district engineer at Jacksonville, Fla., will be placed on the retired list of the regular army April 30 because of physical disability incident to service. He completed deepening of the Duluth-Superior harbor and other civil engineering projects in the harbors of Lake Superior. While in Duluth, he completed the settlement of a lengthy litigation arising from the flooding of low lands around the Lake of the Woods, northwest of Duluth. He will make his home in Miami, Fla., where he will engage in practice as a consulting engineer.

Charles Capper, Northwood, Iowa, who has served as county engineer of Worth County for the last three years, has resigned to enter private engineering practice.

Paul W. Eastman has been named county engineer for Daviess County, Mo., with headquarters at Gallatin.

Alfred Niggemann has been appointed county engineer for Cherokee County, Kan., with headquarters at Columbus, and **Crawford Stevens** is appointed county engineer of Cowley County, with headquarters at Winfield.

Harry E. Blakeley, Nashville, Tenn., has become managing director Highway Contractors' Division, American Road Builders Association, replacing Burton F. Miller, who resigned to be executive secretary of the Michigan Road Builders' Association, Lansing. Mr. Blakeley was graduated from Georgia Tech in 1928, taught civil en-

Down to earth and *in for good!*

MONOTUBE!

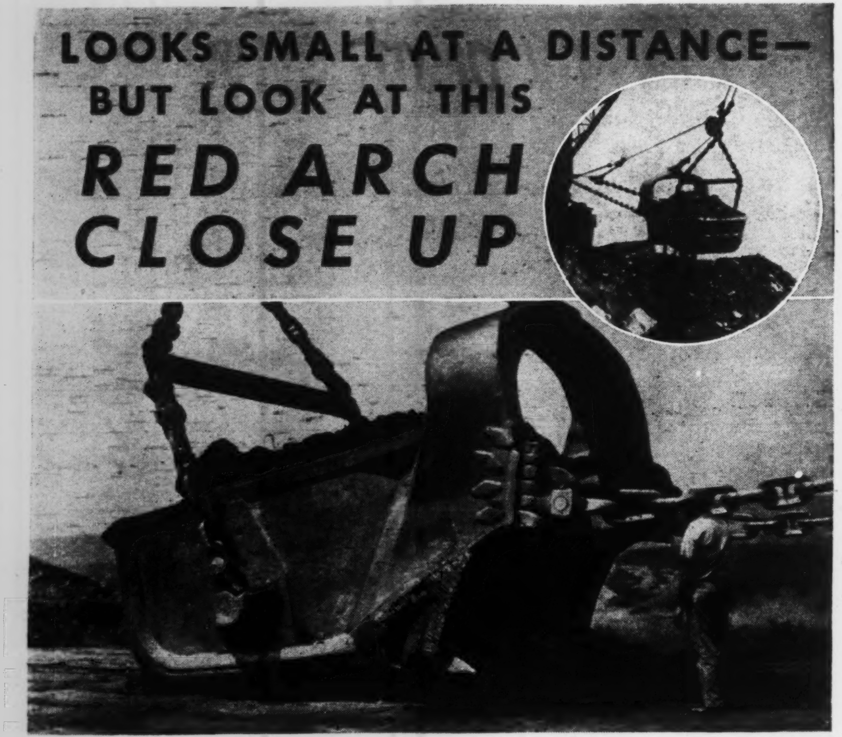
TAPERED steel Monotube piles are the choice of experienced engineers and contractors time after time—job after job. That's because Monotubes have a *combination* of advantages that mean down-to-earth economy and efficiency.

Check over these features—features that bring savings in time and money in constructing foundations for buildings, bridges, piers, airports, highways: Monotubes' fluted, tapered construction permits faster driving with average job equipment; Monotubes are easily extendible to any required length, right on the job; Monotubes are easy to handle, light in weight; Monotubes' tubular design permits quick checking top to toe, before concreting.

Monotubes' many advantages can help get your construction jobs—large or small—started *right.* Available in gauge, size, and taper to meet varying soil conditions. For complete information, write The Union Metal Manufacturing Company, Canton 5, Ohio.

UNION METAL

Monotube Foundation Piles



From far away, even a 25-yard Red Arch bucket looks small, but when you look at the close-up you can see its true proportions.

And you can see more than that, too. You can see the heaped load that's so typical of every pass with a Red Arch, from ⅜-yard on up. You can see the strong, long-life construction that means long "non-stop" use before there's any need for reconditioning. You can see the high arch that permits loads to flow in and out of the bucket easily for fast digging, quick clean dumping. And you can see the smooth, balanced design that means so much to speeding up the digging cycle.

Red Arch buckets are built in three types for light, medium, or heavy digging. Write for information on the size and type you need.

8R45

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

Diamond
Core
Drilling

CORE BORINGS
for Foundations, Dams,
Bridges and all Heavy
Structures
GROUT HOLES

Tinney Drilling Co.
Grafton, W. Va.

BELMONT
IRON WORKS
PHILADELPHIA ROYERSFORD EDDYSTONE

Fabricators *Contractors*
Exporters

STRUCTURAL STEEL
BUILDING & BRIDGES
RIVETED — ARC WELDED
BELMONT INTERLOCKING
CHANNEL FLOOR

Main Office,
Philadelphia, Pa.

New York Office,
44 Whitehall St.

gineering at the University of Tennessee for four years, and later was employed by the Tennessee highway department. He has recently been discharged as a lieutenant colonel of coast artillery after 56 months overseas service.

H. E. Bailey has been named director of the Oklahoma State Highway Department. He had previously served as chief engineer and had been city manager of Oklahoma City. He is an engineering graduate of the University of Tennessee.

R. B. Dunbar has been appointed manager of the Ft. Worth Chapter of the Associated General Contractors of America, Inc., with offices at 815½ Throckmorton St., Ft. Worth. Mr. Dunbar was a colonel in the Army Engineers and is now a major general in the National Guard in command of the 49th Armored Division. He succeeds **Henry A. Harding,** who resigned to accept a position with Ft. Worth Sand & Gravel Co.

E. B. Hickok has been appointed secretary-manager of the Seattle Chapter, Associated General Contractors, succeeding the late Chauncey Smith. He formerly was district auditor and safety engineer for the South Construction & Engineering Co. at Seattle, having been with that company since 1941. Hickok previously had served for six years as an engineer with the Nebraska state department of roads and irrigation.

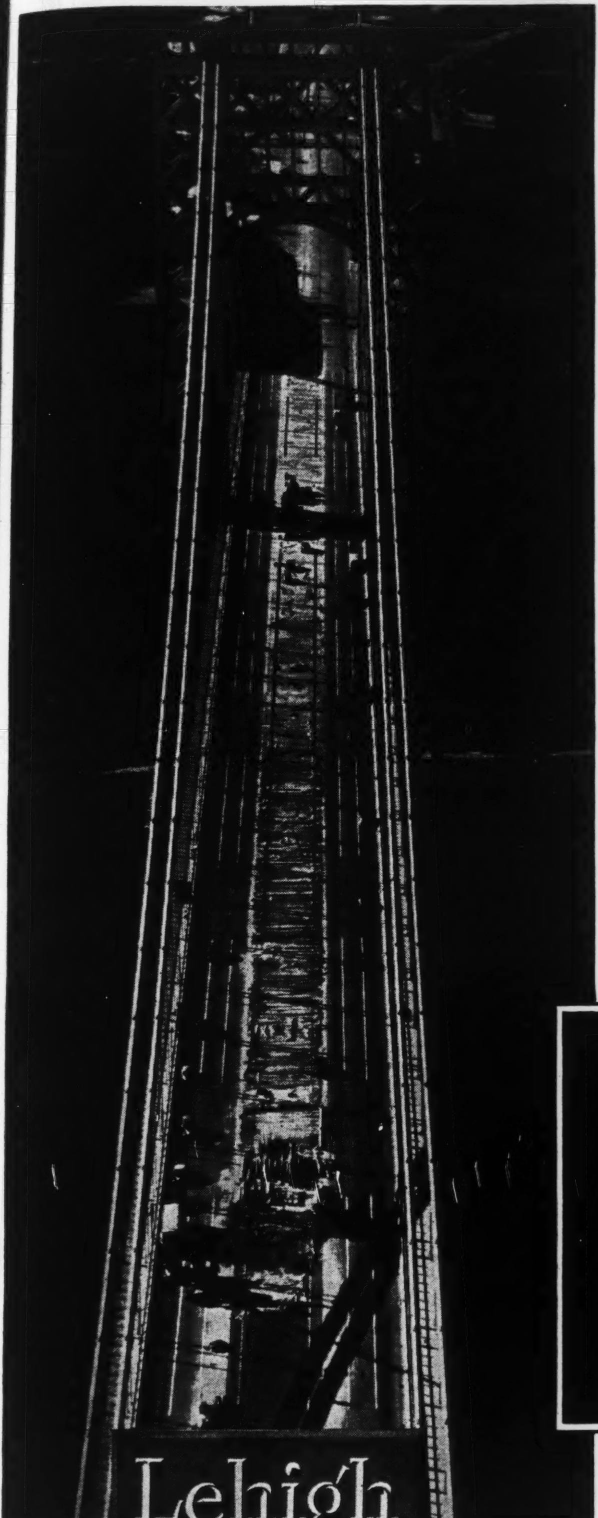
A. J. Laverty is now superintendent of public works at Ithaca, N. Y. He formerly was in charge of the sewage treatment section. A graduate of M.I.T. and the School of Military government, Charlottesville, Va., during the war he was a lieutenant colonel in the Air Force and overseas was sanitary engineer with the 12th Army group in military government.

Winston H. Carrington has opened a civil engineering office at 33 Broad Street, Charleston 3, S. C., and will specialize in construction layout, route design and surveys, and land surveys and maps.

Albright & Friel, Inc., consulting engineers, have moved their offices to Suite 816-822, at 1528 Walnut Street, Philadelphia 2, Pa.

Lester Casey, Sioux City, Iowa, has been named county engineer for Cherokee County, Iowa, with headquarters at Cherokee. He replaces **W. T. Hosmer,** who resigned recenty to accept an associate professorship at the Iowa State College, Ames, Iowa.

Poirier & McLane Corporation, 33 West 42nd Street,
New York City, for the Port of New York Authority.



Somewhere on nearly every job...

LEHIGH EARLY STRENGTH CEMENT WILL SAVE TIME OR MONEY . . .

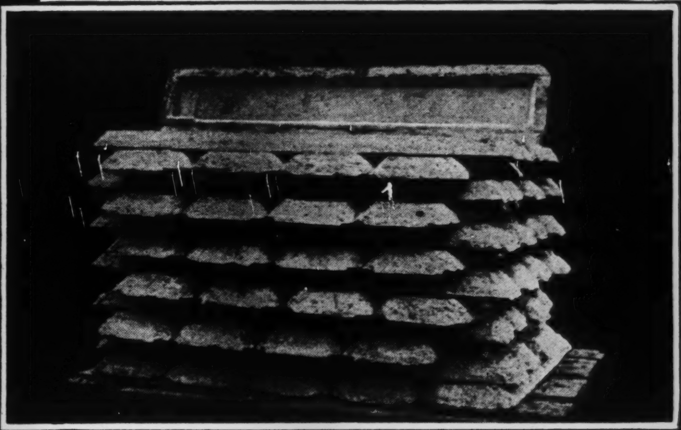
Of the several types of approved forms for the paving of the two center lanes of the George Washington Bridge, the Poirier & McLane Corporation, contractors, wisely selected pre-cast concrete.

This selection eliminated the expense of scaffolding for forming and stripping . . . the concrete forms were integrated with the concrete paving and remain a permanent part of the structure.

With Lehigh Early Strength Cement and 55 gang molds, it took only 40 days to complete 22,000 form units . . . saving the expense of at least 3 times the number of molds that otherwise would have been required. What's more, the use of fast-curing Lehigh Early Strength Cement assured the production necessary to keep paving operations moving on schedule.

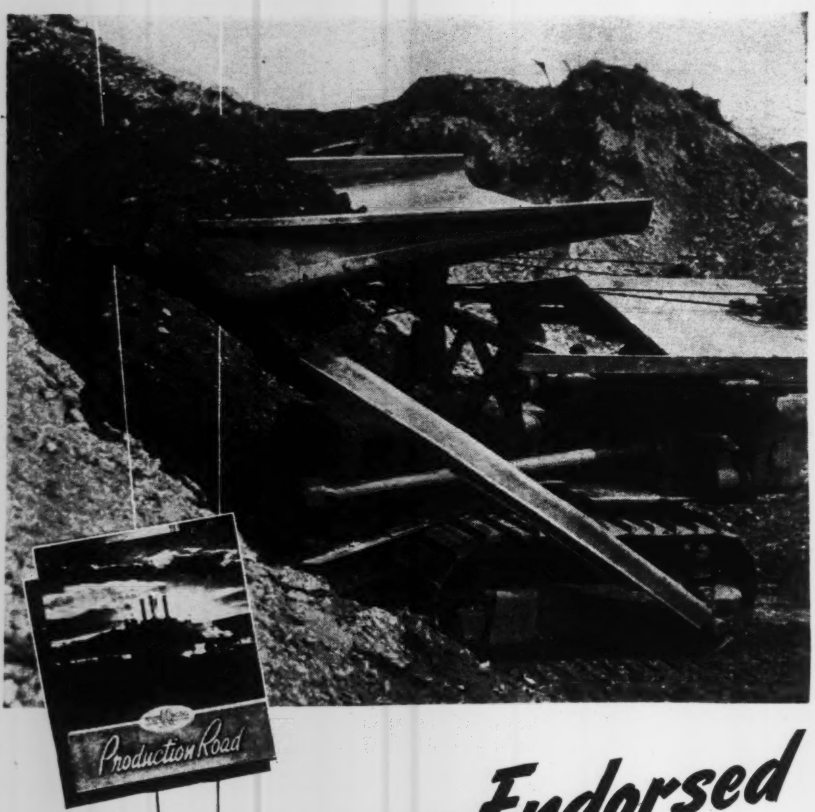
That's why we say: somewhere on nearly every job Lehigh Early Strength Cement will save time or money. Let our Service Department consult with you on your specific problems.

These pre-cast form units became a permanent part of the concrete paving in which Lehigh Portland Cement was used.



LEHIGH EARLY STRENGTH CEMENT
• LEHIGH MORTAR CEMENT •
• LEHIGH NORMAL CEMENT •
LEHIGH AIR-ENTRAINING CEMENT

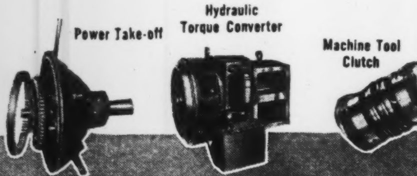
LEHIGH PORTLAND CEMENT COMPANY • ALLENTOWN, PA. • CHICAGO, ILL. • SPOKANE, WASH.



Performance Endorsed

All major manufacturers of heavy-duty construction equipment standardize on Twin Disc Clutches and Hydraulic Drives . . . the finest possible endorsement of the 29-year record of superior performance by Twin Disc units.

More than 350 makers of various types of powered machinery offer Twin Disc Clutches and Hydraulic Drives as standard or optional equipment. The "Manufacturer's Issue" of PRODUCTION ROAD, a 52-page magazine, mentions these manufacturers, and 139 photographs give documentary evidence of the repeated performance endorsements given Twin Disc units by manufacturers and equipment users alike. Write the Twin Disc Clutch Company, Racine, Wisc., for a free copy of this magazine. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).



TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

Elections and Activities

Harvey B. Kinnison

The Boston Society of Civil Engineers has the following officers: Harvey B. Kinnison, president; Everett N. Hutchins, vice-president; Edwin B. Cobb, secretary; Chester J. Ginder, treasurer. Directors elected are Herman G. Protze and George W. Coffin.

The new president was graduated from the University of Idaho, 1914, in civil engineering. He entered the water resources branch, U. S. Geological Survey in California, 1918, and collected data in connection with water rights on the Lower Colorado River of Texas. In 1921, Mr. Kinnison was assigned to the Kansas office where in 1925 he was appointed district engineer, and later transferred to the Boston Office as district engineer in charge of work covering a large portion of New England. He has reported stream flow data, and prepared reports on the 1927 and 1938 floods, and has contributed many articles in the field of hydrology.

Samuel J. Callahan has been elected president of the Kansas City section of the American Society of Civil Engineers. Other new officers are Ansel N. Mitchell, first vice-president; Mark C. Culbreath, second vice-president, and Joseph Sorkin, secretary-treasurer.

Charles M. Sprinkle has been elected president of the Winston-Salem, N. C., Engineers Club succeeding Mason Garber. Other officers elected for the coming year are: Harry Day, secretary; Wilson Lamb, treasurer; and B. S. Mauney, Walker Cantrell and W. E. Gaines, director.

J. Parker Garwick, of Haigh M. Boyajohn & Associates, has been reelected president of the Columbus, Ohio, Builders Exchange. Other officers elected were: Earl A. Case, Mulligan Case Co., first vice-president; Robert G. Kern, Columbus Builders Supply, Inc., second vice-president; John A. Knight, secretary-treasurer, for 26th consecutive year; and following directors: A. P. Harness, Jr., of Jennings-Lawrence Co.; C. V. McKnelly, of Pittsburgh Plate Glass Co.; William

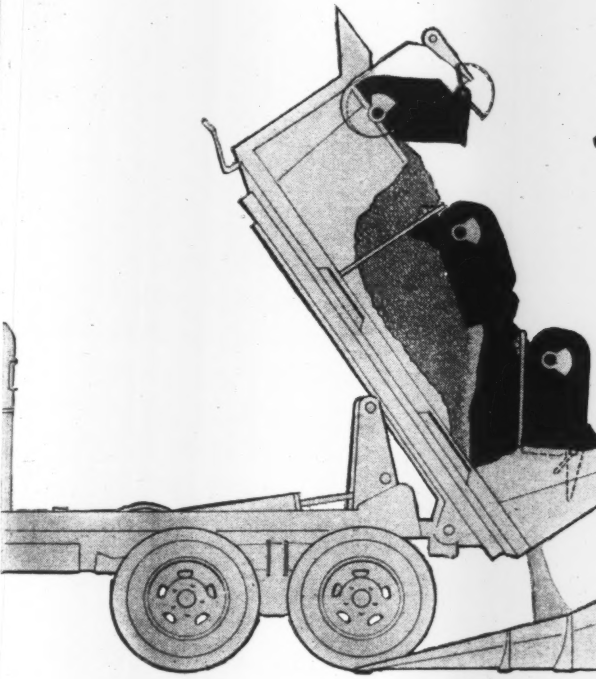
TURN O MATIC

CEMENT BOXES

SPEED BULK CEMENT HANDLING

ASSURE DELIVERY IN PERFECT CONDITION

SIMPLIFY BATCH EQUIPMENT



OPERATION—By dumping cement and aggregate at the same time, mixer can be fed quickly and systematically. When the dump body is raised to discharge the batches, Cement Boxes fall back against the aggregate. Off center position of trunnions usually keeps Boxes upright until this time. Before releasing a batch, the spotter unclamps the corresponding waterproof Box lid by pulling back the lid handle with a hooked pole. When batch is released, Cement Box is automatically inverted, discharging cement at the same time as the aggregate, without splash or dust.

INSTALLATION—For use with single or multiple batch trucks, Cement Boxes are easily installed close to or against the front of the batch compartments, with trunnions at approximately the same level as batch gate hinges. Once installed, these watertight TURN-O-MATIC Cement Boxes always deliver cement at the RIGHT time—in PERFECT condition.

Cement Boxes may be removed from dump body when using the unit for other types of service.

SIZES AND DIMENSIONS

	No. 15 (15 Cu. Ft. CAP.) For 34 Cu. Ft. BATCH
LENGTH	60"
WIDTH	18"
DEPTH	29"
WEIGHT	270 lbs.

SHIPMENT FROM PITTSBURGH, PA., AND GALION, OHIO

EXCLUSIVE DISTRIBUTOR

DRAVO·DOYLE COMPANY

2600 PREBLE AVENUE, PITTSBURGH 12, PA., CEDAR 2500

RAINCAP
New!

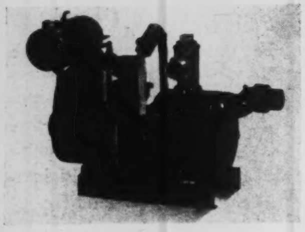
THE CAP THAT DOES NOT FORGET TO CLOSE
Completely automatic—the "RAINCAP" is counterbalanced to open when the tractor starts and close when it stops. Rust proof — made of cast aluminum — can be installed in two minutes. F.O.B. Waterloo, Iowa. Prices subject to change without notice.

STOPS MOISTURE FROM FALLING INTO TRACTOR EXHAUST . . Just slip the "RAINCAP" over the open end of your tractor exhaust, and you eliminate forever the danger of moisture falling into the exhaust, injuring your tractor.

Outside Diameter Exhaust	*Caterpillar Model*	*Price*
1½"	Starting Motor	$1.90 plus tax
2½"	D2	1.90 plus tax
2½"	D4	1.90 plus tax
2½"	D6	1.90 plus tax
3"	D7	2.50 plus tax
3"	D8	2.50 plus tax

WATERLOO FOUNDRY CO., WATERLOO, IOWA

CARTER



HUMDINGER SELF PRIMING CENTRIFUGAL PUMPS

Performance — Stability — Economy — three words which embody the CARTER tradition for producing the best! Every buyer knows that it's experience which counts. You the customer know that only a well tried and proven product can be relied on to do the job.
When you choose CARTER you get fifty years of manufacturing experience in the finest pump engineering skill can develop.

- *Write for Bulletin 4503*

RALPH B. CARTER CO.
HACKENSACK, NEW JERSEY
53 PARK PLACE, NEW YORK 7, N. Y.

LONG EXPERIENCE AND EXTENSIVE FACILITIES FOR ENGINEERING AND CONSTRUCTION IN GUNITE

- **Lining for tunnels, mines, steel bins and hoppers**
- **Lining old, tuberculated, or clogged water mains to renew life and increase flow capacity**
- **Rehabilitation of dams, docks, bridges and walls**
- **Restoration of spalled, weathered or damaged concrete buildings**
- **Refractory linings for furnaces and stacks**

Our Engineers are available for consultation

NATIONAL GUNITE CORPORATION

420 Lexington Avenue — New York 17, N. Y.
101 West Dedham Street — Boston 18, Mass.
418 Evans Building — Washington 5, D. C.

K. Kline, of Superior Cement Co.; and James S. Clutter, of Bexley Decorating Co.

A. R. Burbeck has been elected president of the Home Builders Association of Greater Akron, Ohio, with Phil J. Franz, vice-president; Harold M. Carson, secretary-treasurer, and C. R. Miller, Phil J. Franz, Gus Kalstrom, and Paul Novak as trustees.

The North Carolina Society of Engineers has bestowed its annual award for "outstanding engineering achievement" upon Prof. L. L. Vaughan, head of the Department of Mechanical Engineering at North Carolina State College. Prof. Vaughan has been connected with the college since he entered as a freshman in 1902. He has been a member of the faculty for 39 years.

Glenn Park has been installed as president of the Charlotte, N. C., Engineers Club, succeeding Claude Harris.

H. K. Carr, Greentown, has been elected president of the Indiana Well Drilling Contractors Association. Other officers are: vice-president, Robert Shriver, South Bend; secretary, Earl Merritt, New Augusta; treasurer, W. L. Gordon, Churubusco, and director, Herbert Lamb, Carmel.

C. S. Clark of Donna, member of the Texas State Board of Water Engineers since 1917 and chairman for 12 years, has submitted his resignation to Gov. Beauford H. Jester, effective March 15. He will go into business. Other members of the water board are John W. Pritchett and E. V. Spence.

Walter A. Pierce, superintendent of the Racine, Wis., water department, was elected president of the Wisconsin Society of Professional Engineers. Charles S. Whitney, Milwaukee, is 1st vice-president, George Martin, Green Bay, second vice-president, O. J. Muegge, Madison, secretary, and L. M. Schissdler, Appleton, treasurer. The trustees are Pierce G. Ellis, Milwaukee, Joseph Lustig, Jonesville and Clarence W. Zachow, Clintonville. A. T. Behling, Milwaukee and Ben G. Elliott, Madison, were named national representatives.

Newly-elected officers and directors for 1947 of The Associated General Contractors of Illinois are: President, Fred W. Shappert, Jr.; vice-president, P. F. Loiselle; treasurer, Thomas H. Joyce, Jr. Directors, Frank C. Feutz, T. E. Fieweger, A. C. Hoeffken, W. H. Kewley, Norman R. Jansen, and H. H. Hall.

Elected as officers for the Springfield,

Split-Second Timing pays off . . .

ATLAS ROCKMASTER BLASTING gets results

In golf the right club plus know-how, plus split-second timing that applies power at just the right moment produces the shot that pays off. The precision timing of the new Atlas Rockmaster Blasting System is paying off. Never before has the blaster been able to achieve such amazing control of timing. And never before has he had such sensational results.

Atlas Rockmaster makes it possible for the blaster to time the delay elements of his shot in thousandths of a second. A split-second after the rock is knocked off balance by the first blast, it is hit again . . . with results you actually have to see to believe.

When Rockmaster is used dollars are saved. A tremendous increase in fragmentation is being reported by blasters all over the country . . . in many instances the increase is as high as 30%. Secondary shooting has been cut down . . . shovel efficiency stepped-up. And trouble-making complaints due to noise and vibration have practically disappeared.

Rockmaster is not just a timing device. Rockmaster is a complete blasting system of which precision timing is only a part. All factors of the blasting problem—detonators, explosive and loading—are taken into account and combined with your know-how and ours to produce true Rockmaster effectiveness.

To get outstanding results yourself, call in the Atlas representative and ask him how Rockmaster can be adapted to your blasting problem.

ROCKMASTER GIVES YOU THE GREATER SAFETY OF MANASITE DETONATORS

ATLAS POWDER CO.
ATLAS EXPLOSIVES

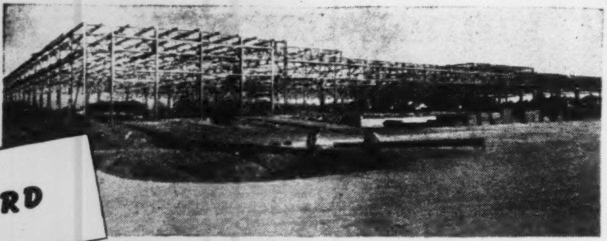
Less Bark . . .
More Bite

Manasite: Reg. U. S. Pat. Off. "ROCKMASTER"—Trade Mark

ATLAS EXPLOSIVES

"Everything for Blasting"

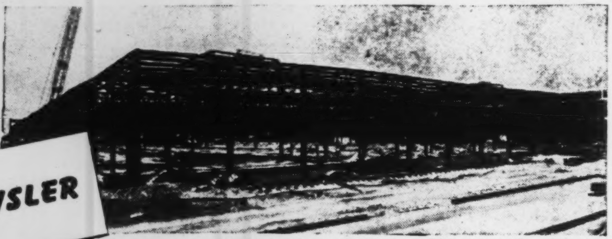
ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*


FORD

Ingalls fabricated steel used in the new Ford assembly plant at Hapeville, Ga.

GENERAL MOTORS

. . . and in this addition to General Motors' Harrison Radiator Division, Lockport, N. Y.


CHRYSLER

. . . and in the new Dayton, Ohio plant for Chrysler Corporation's Airtemp Division

AS INDUSTRY GROWS...

Ingalls fabricated steel is the framework for many of the nation's new and expanded manufacturing plants. Steel bearing the Ingalls label is thoroughly dependable. Formed to exact specifications, it requires a minimum of cutting or fitting on the job.

If fabricated steel figures in your construction plans, contact Ingalls at once. We will gladly submit quotations or any other information you desire.

INGALLS STEEL

THE INGALLS IRON WORKS CO., THE INGALLS SHIPBUILDING CORP., The Steel Construction Co., Birmingham Tank Co. Fabricating plants at Birmingham and Pittsburgh. Shipyards: Pascagoula, Miss., and Decatur, Ala. Offices: BIRMINGHAM, Pittsburgh, New York and New Orleans.

Ill., Engineers' Club, are: President, E. S. Rynearson, assistant engineer, bureau of maintenance, Illinois Division of Highways; first vice-president, H. C. Helmle, chemist, bureau of materials, Illinois Division of Highways; second vice-president, Dean Lyman, safety director, Allis-Chalmers Manufacturing Co.; secretary-treasurer, Tom Cofer, overhead system engineer, Central Illinois Public Service Co. Clarence Armstrong was named sergeant-at-arms.

The following officers of the New York Association of Consulting Engineers for 1947 have been elected: President, Darl H. Hunt; vice-president, William Eipel; secretary, Edward Sears; and treasurer, Harry Bond.

The following officers for 1947-1948 have been chosen by the Constructors Association of Western Pennsylvania: President, Carl J. Jacobsen; vice-president of Heavy Division, Joseph B. Fay; secretary, John E. O'Leary; treasurer, Russell C. Swank.

R. L. Morrison of Hattiesburg, Miss., is the new president of the Mississippi Society of Professional Engineers, succeeding A. B. Hargis of the University of Mississippi, who was named vice-president. Boyce A. Biggers is secretary-treasurer.

David C. Shaefer has been named secretary-manager of the Memphis, Tenn., Chapter, Associated Contractors, replacing W. B. Rosenthal, who has been retained as counsel.

Thomas Buckley, recently appointed director of public works of Philadelphia, Pa., was honored at a testimonial dinner of the Metropolitan Philadelphia chapter of the American Public Works Association on Feb. 27. More than 500 attended the meeting, which was held in the Philadelphia Engineers Club. Mr. Buckley's record of 41 years of continuous service with the city, culminating with his appointment as public works director in 1946, was extolled by Mayor Bernard Samuel, who pointed out that the new director would be responsible for the largest program of public works that the city has ever undertaken at one time. Presentation of a desk pen set to Mr. Buckley was made by Samuel M. Baxter, projects engineer of the public works department, and president of the APWA.

The New York Association of Consulting Engineers has voted to extend to the United Nations Staff an offer of the cooperation of the association during the early stages of the design of the proposed new headquarters buildings. The president and the executive

COMMITTEES THE COUNTRY OVER FIND:

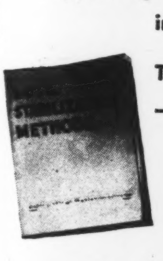
IT'S PLANT MIX QUALITY AT ROAD MIX COST!

The SEAMAN MIXER

ENGINEERS and CONTRACTORS recognize today that with the SEAMAN MIXER there are no uncertainties and no variables in the mix produced. In thoroughness, in control of voids and in high daily production the work of the SEAMAN meets the strictest specifications; — no better mix can be obtained with any equipment of any type.

But more, the SEAMAN can control certain inescapable conditions that often occur in road construction. For example, if pit run aggregate is used in bituminous construction, frequently the fines are found in one area of the treatment and coarse material in another. By the application of more oil to the fines, — less to the coarse, — two passes of the SEAMAN compensate for the irregularity and prevent "rich" or "lean" spots from appearing. Furthermore, the "carry" of mixed materials within the mixing hood averages the mix and in itself promotes uniformity.

These and many other advantages are SEAMAN characteristics, — all at the low-cost that prevails in road-mix operation.



As popular as ever, — this handy, practical book, "Soil Stabilization Methods" — compiled by Seaman engineers. Have you sent for your copy? Ask for Bulletin R-25.

SEAMAN MOTORS, INC.

Milwaukee 3, Wisconsin

committee were authorized to write to Trygve Lie offering such assistance. It is believed that engineering advice would be helpful in considering various designs and plans. The association's work would be done in cooperation with various architects who are expected to serve during the preliminary stages.

At the recent annual meeting of the Iowa Well Drillers Association held at Marshalltown, Arthur Bruinekool, of Pella, Iowa, was elected president and Arthur Vinson, of Fort Dodge, vice-president. H. Landgraf, of Dubuque, retiring president, automatically became a member of the board of directors for three years.

The Wisconsin County Highway Commissioners' Association has elected the following officers:—Paul A. Hartig, LaCrosse County, president; John Rusch, Longlade County, vice-president; Edward Beekedal, Manitowoc County, secretary; Charles W. Thompson, Madison, treasurer. The committee members' association elected F. J. Lurquin, Brown County, president, Grover Dobbertin, Waukesha County, vice-president, C. J. Virlee, Door County, secretary, Charles A. Thompson, Madison, treasurer.

Key men in highway construction work attended the recent annual conference of construction engineers and inspectors of the Delaware State Highway Department at Dover. Chief Engineer William A. McWilliams opened the conference. W. W. Mack, former chief engineer and now special consultant for the department, reviewed highway construction work in the state, during which he cited the progress and improvements made during the nearly 30 years he has served the department. Walter B. McKendrick, Jr., assistant chief engineer, outlined future operations.

The Illinois Society of Professional Engineers has selected the following officers: D. M. Campbell, Chicago, president; E. E. Cooper, Decatur, vice-president; H. E. Babbitt, Urbana, secretary-treasurer. Chosen as representatives to the Illinois Engineering Council were: W. Wallace, Chicago; W. J. Downer, Springfield; J. M. Whalen, Joliet; Arnold Lundgren, Rockford. Named representative to the National Society of Professional Engineers was W. A. Oliver, Urbana. Oliver's appointment as editor of the "Illinois Engineer" was also confirmed.

H. C. Bender, who served 14 years as secretary of the Associated Engineers of Spokane, Wash., has been elected president for 1947. Noel Thompson was named vice-president to represent the architects; Bliss Moore, for the mining engineers; W. L. Thrailkill, electrical; S. H. Excell, professional, and L. A. Shirk, mechanical.

The Montana section of the American Society of Civil Engineers has elected Paul M. Johnson as president; Fred E. Thieme, first vice-president; Wilbur S. Hannah, second vice-president, and E. H. Thomas, secretary.

James T. White, Fort Wayne traffic engineer, has been elected president of the Indiana Traffic Engineers Association. Elmo E. Stuckey, traffic engineer for the Fort Wayne district of the Indiana Highway Commission, was named secretary-treasurer.

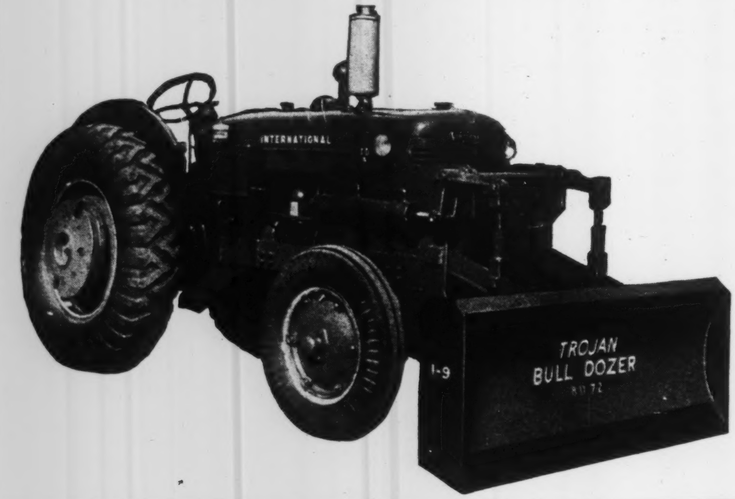
Sam G. Schweiker, president of Schweiker Bros., has been elected president of the Akron, Ohio, Builders Exchange. Other officers: A. Bertsch, first vice-president; Harry A. Englehart, second vice-president; Theodore Cook, treasurer; and A. W. Dickson and E. G. Mangold, director-at-large.

Arthur A. Ornst of Selzer-Ornst Co., Milwaukee, Wis., has been elected president of the General Contractors Association of Milwaukee. Other offi-

TROJAN

COMBINATION BULLDOZER AND SNOW PLOW

for International Industrial Wheel Type Tractor



Trojan Bulldozers are designed for year-around service. The bulldozer blade and V type or reversible blade snow plows are interchangeable.

The parallel lift is a patented feature which raises the blade in a straight line and holds the vertical position throughout the lifting range. This device prevents digging in and consequent stalling and wheel slippage.

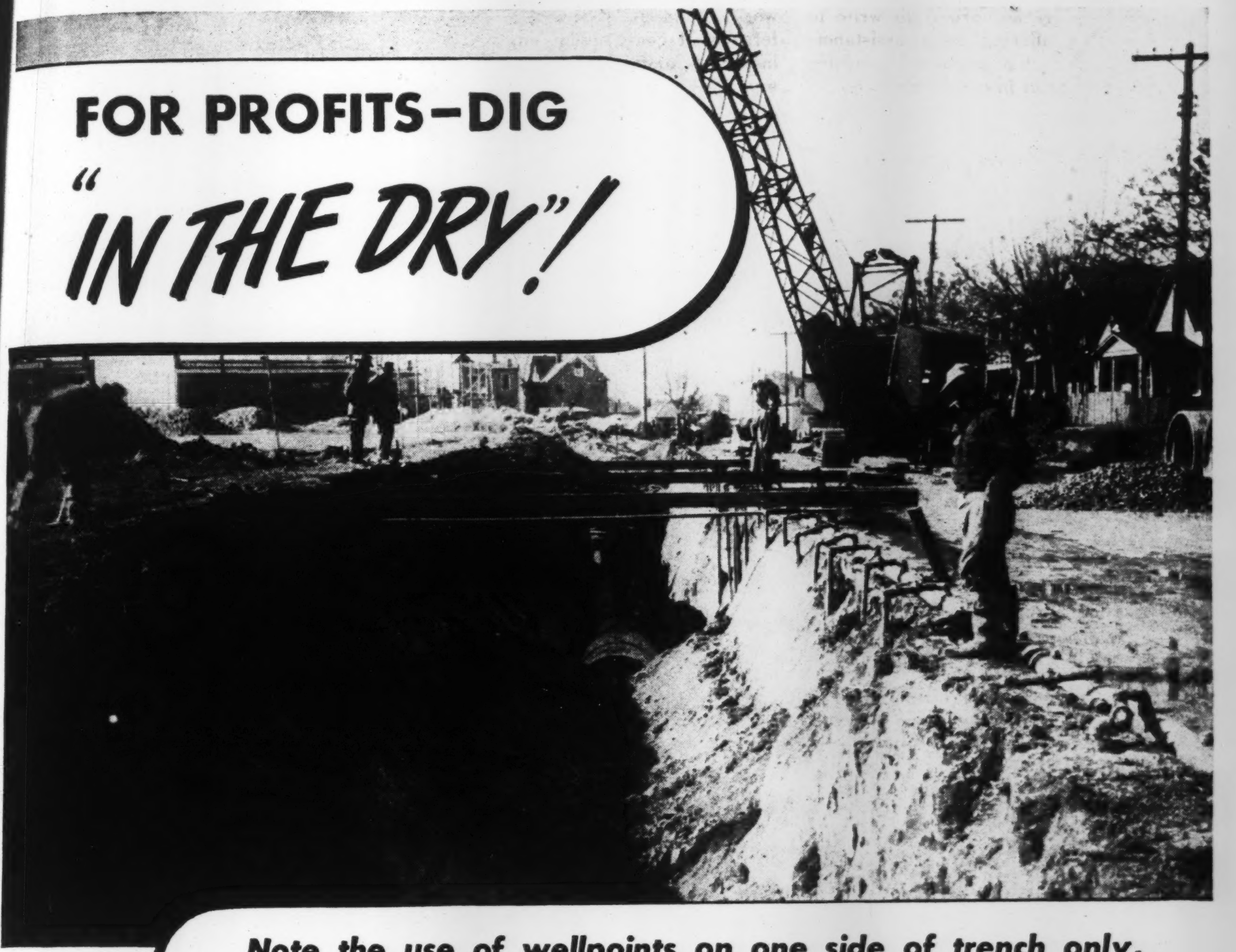
Trojan mountings are so constructed that the rear of the Tractor is free of all obstruction and permits installation of a rear power take-off whenever desired.

Three models are available designed to fit the I-4, I-6 and I-9 International Industrial Wheel Tractors.

Write for literature and specifications or see your International Industrial Distributor.

CONTRACTORS MACHINERY CO., INC.
DEPT. NR 71 BATAVIA, N. Y.

FOR PROFITS—DIG "IN THE DRY"!



Note the use of wellpoints on one side of trench only, and the absence of sheeting on this trunk sewer project.

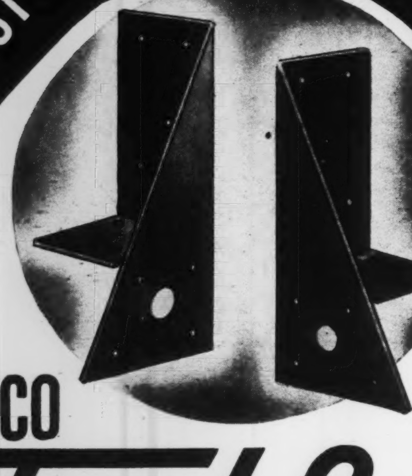
JOBS — plenty of them coming out for bids soon. Many will be wet. And the way to handle a wet job profitably is to let a MORETRENCH WELLPOINT SYSTEM take care of the water.

MORETRENCH can give you the best in equipment, engineering, and supervision. We'll appreciate the opportunity to demonstrate that we can save time and money for you on your next wet job.

Catalog Sent on Request

MORETRENCH CORPORATION

90 West St. New York 6	**3037 S. Christiana Ave. Chicago 23, Illinois**	**2424 Chicago Ave. Tampa 6, Florida**	**315 W. 25th St. Houston 8, Texas**	**Rockaway New Jersey**



THE NEWEST THING FOR HOUSING

TECO

Trip-L-Grip

FRAMING ANCHORS

These economical, scientifically developed secondary connectors for lumber framing are as revolutionary for housing as TECO connectors were 13 years ago in turning timber into an engineering material.

Here are a few of the advantages over old fashioned, expensive methods:

- Toe nailing uncertainties eliminated.
- Bridging eliminated in attaching joists to trusses.
- Stronger in supporting joists against ledgers or beams.
- Notching eliminated.
- Wind anchorage effected.
- Saves material, every nail performs to full capacity.
- Saves costs connecting joists to walls—ledgers to beams.
- Eliminates ledger strip.

WRITE *Today* FOR YOUR FREE BOOKLET

Specify TECO TRIP-L-GRIP ON YOUR HOUSING

TIMBER ENGINEERING CO.
1319 - 18th STREET, N. W.
WASHINGTON 6, D. C.

Please send me FREE copy of your new booklet on TECO TRIP-L-GRIP Framing Anchors and quote prices.

NAME.......................... TITLE..........................

COMPANY ....

STREET.......................... CITY.......................... STATE..........................

ENR

cers elected are T. L. Cottam, Hunzinger Construction Co., vice-president; John H. Dahlman, Dahlman Construction Co., secretary-treasurer; W. H. Emory, Klug & Smith Co., and William F. Kachel, Siesel Construction Co., were elected directors. S. H. Eigel is manager of the association and Gordon B. Yule is assistant manager.

C. S. Finkbeiner, past president, has been named to the board of directors of the Toledo section, American Society of Civil Engineers—Samuel C. McKee will serve as chairman of the program and publicity committee, and will be the contact member with the University of Toledo student chapter. Other committee chairmen are: R. C. Hansen, junior committee; W. S. Smith, engineering education; W. P. Sanzenbacher, auditing and financing; H. G. Wood, membership; C. H. Kurtz, attendance; H. J. Jones, professional conduct; and R. W. Abbott, local section committee on Engineers Joint Council and Toledo Technical Council.

C. S. Christian of Little Rock, elected president of the Arkansas Engineers Club, succeeds V. E. Scott of Little Rock, who was named chairman of the board of directors. Other officers are: E. E. Mashburn of Little Rock, vice-president; Mike Thomas of Little Rock, secretary-treasurer, and Ray Metzger of Little Rock, steward.

W. B. Ferguson of Burnsville, N. C., district 2 engineer in the 10th Division of the North Carolina Highway and Public Works Commission, was elected president of the highway division of the State Employees' Association at an organization meeting held at Raleigh. E. A. Crump of Wilson, assistant fourth division engineer, was named vice-president; and Otis Banks of Raleigh was elected secretary-treasurer.

The organization was set up for "fixing and maintaining salaries at a level sufficiently high to assure an adequate standard of living, as well as to enable the state to suffer no disadvantage in competition with private industry for competent personnel" and for "perpetuating efficiency in personnel by assuring economic security through liberal revision of the present Retirement Act."

The constitution of the group stipulates that the association "is never to be affiliated with the United Public Workers of America, the AFL, the CIO or any other national labor organization."

Edgar C. Stewart, of Wichita, has been elected president of the Kansas Contractors Association. M. Clare Miller, of McPherson, was elected vice-

No other truck has this...

It's a rubber Shock Insulator...developed by Mack engineers more than 20 years ago. It was--and still is--the best means of retaining spring ends.

Shock Insulators do away with binding metal surfaces...there is no metallic contact between springs and chassis. They absorb vibrations. The need for lubrication and adjustment at spring ends is eliminated. Squeaks, rattles, and fast wear of parts are unheard of. Shock Insulators provide smooth performance under heavy loads. They lengthen working life indefinitely.

But how about wear? Shock Insulators have been known to last over ten years. Security? It's impossible for the spring to pull out of its housing. Twisting? The spring can never twist. Removal? It's simple and quick. Shock Insulators aren't complicated.

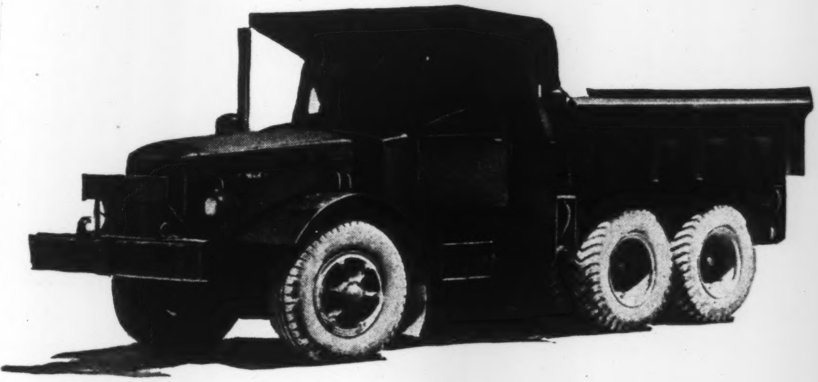
Only Mack employs rubber Shock Insulators as spring-end connectors. That's another good reason why you get more work out of a Mack. More work goes into it.

Mack

since 1900, America's hardest working truck

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada, Mack Trucks of Canada Ltd.

Trucks for every purpose



UNBEATABLE for downright hard work is a Mack six-wheel truck with Mack Balanced Bogie! Here is one of the fleet operated by **Ash Grove Lime and Portland Cement Co., Louisville, Nebraska.**

FORMULA No. 640
a clear liquid waterproofing for old or new construction

PENETRATES
deeply—one inch or more—is not a surface treatment. Brush, spray, or float on stone, cast stone, concrete, mortar, stucco, tile, brick, plaster, wood, wall board — any absorbent material.

WATERPROOFS,
preserves, prevents dusting of floors, surface dirt washes away in rain.

FORMULA NO. 640
is a balanced formula of seven different waxes and resins in a hydrocarbon solvent.

ACID-ALKALI proof
does not oxidize, unchanged by temperature.

PERMANENCE
it is our opinion it will last as long as the concrete, mortar, stucco, etc. lasts.

OIL PAINT
saponifies on cement unless sealed first with Formula No. 640.

APPLY to either side:
The pressure side, or opposite side —it is equally effective.

HYDROSTATIC PRESSURE
a 20 foot head has been held by Formula No. 640.

CUTS WATERPROOFING COSTS
because it applies three times as fast as paint, requires no special technique.
No preparation — comes ready to apply.
Eliminates necessity of furring.
Concrete floors and walls need no membraning.

Keeps in all climates
Harmless to use
Good coverage
Moderate price

Write our Engineering Department for office test kit, technical data, or regarding any special problem.
J. Wilbur Haynes, Engineer

OTHER PRODUCTS: Formula No. 640 Toxic, combines waterproofing with termite and fungus protection; cement hardener; floor mastic; roof coatings, etc.

HAYNES PRODUCTS CO.
4007 Farnam St.
Omaha 3, Nebr.

president, and C. L. Burt, of Hutchinson, treasurer. Named to the executive board were Ralph H. Rhoades, of Newton; Grant A. Stannard, of Wichita, M. W. Watson, of Topeka, and E. W. Gieger, of Leavenworth. J. W. Ballard, and Miss Martina Hyatt, of Topeka, were appointed to continue as secretaries of the association.

W. Paul Lyman of Raleigh, N. C. has been elected president of the North Carolina Society of Engineers and the society adopted a resolution urging full support of a proposed joint state-federal plan for a complete topographical mapping of North Carolina. Lyman succeeds T. J. Hewitt of Wilmington. R. P. Reece of Winston-Salem was named vice-president and L. M. Keever of Raleigh was re-elected secretary-treasurer.

The 16th annual dinner of the Engineer's Society of Pennsylvania will be held at the Penn Harris Ballroom, Harrisburg, Pa., on Feb. 25. The speaker will be Robert S. Peare, vice-president of General Electric. He will speak on the timely topic of public relations.

The Idaho Society of Engineers has elected L. E. Stalker, Idaho Falls architect, as president; Orland C. Mayer, Idaho Power Co., Boise, vice-president; Virgil Johnson, Boise civil engineer, secretary; and A. L. Biladeau, sanitary engineer for the state department of health, Boise, treasurer.

The Montana Contractors Association and the Montana Builders Association have affiliated with the Associated General Contractors of America and appointed J. Edward Hergert as secretary-manager for both organizations. This is the first time the A.G.C. has had a secretary-manager in the state. Hergert was assistant manager of the Mountain Pacific chapter at Seattle, Wash., until recently. Don McKinnon of Helena is president of the new Montana chapter, with Floyd Pappin of Great Falls vice-president and the following serving as directors: Charles Pew, Missoula; William Lowe, Billings, and Eddie O'Neil, Havre.

The Kentucky Society of Professional Engineers has elected R. C. Page, Lexington, as its president succeeding W. R. McIntosh, Louisville. Also elected were M. D. Ross, Frankfort, and H. A. Spalding, Hazard, vice-presidents; C. S. Crouse, Lexington, secretary-treasurer, for the 14th consecutive year, and C. B. Owens, Frankfort; E. R. Ronald, Louisville, O. L. Depp, Madisonville, and W. R. McIntosh, directors. The directors will serve 2-year terms.

DUFFIN IRON COMPANY
Established 1870
FABRICATORS of STRUCTURAL STEEL
Buildings, Bridges and All Type of Steel Structures
●
General Office and Works:
4837 So. Kedzie Ave.
Chicago 32, Ill.
Phone Lafayette 0732
●
Contracting Office:
Suite 1600 - 37 W. Van Buren St.
Chicago 5, Ill.
Phone: Harrison 8813
●
For Service and Dependability Have It Fabricated by Duffin!

KEEP YOUR CONVEYOR BELTS GOING

FLEXCO H D RIP PLATES are used in repairing rips and patching conveyor belts. Their use saves expensive replacements and extended shutdowns.

FLEXCO H D BELT FASTENERS make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

● Avoid shutdowns and lengthen the life of your conveyor belts and bucket elevator belts by using Flexco belt fasteners. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.

Bulletin F-100 shows exactly how to make tight butt joints in conveyor belts with Flexco. Also illustrates step by step the latest practice in repairing rips and putting in patches.

Write for your copy.

FLEXIBLE STEEL LACING CO.
4656 W. Lexington St., Chicago

FLEXCO HD BELT FASTENERS
Sold by supply houses everywhere

AGGREGATES AWEIGH — AND AWAY — *Fast!*

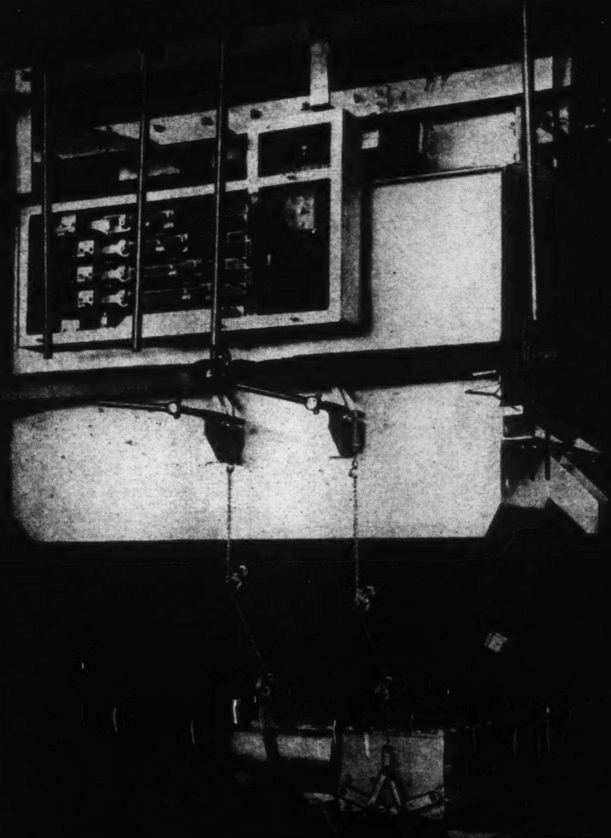
KEEPING up with a dual drum paver plus a 27E from the same batcher is high production by anyone's standard. It's no stunt performance but a regular day-in, day-out procedure for a Butler Weigh Batcher equipped with Selective Beam Control.

★

High production, however, is only one talent;—in Butler Weigh Batchers any production demand, no matter how quick-stepping, is always coupled with absolute accuracy.

★

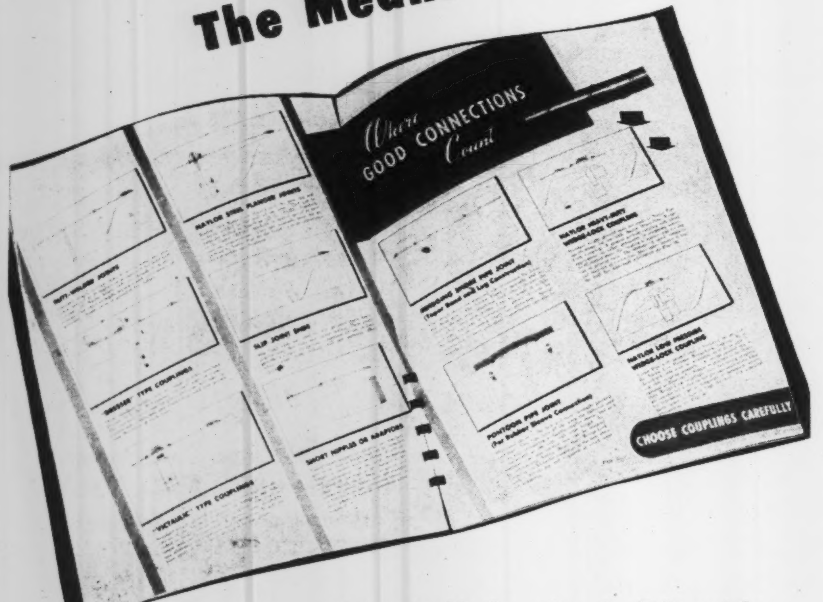
Such production requirements are not those of tomorrow;—they are here now. The contractors who will build the gigantic airfields to handle the planes of today which attain almost the speed of sound, the contractors who will lay the great highways already at the construction stage,—are the contractors who are BUTLER equipped.



BUTLER BIN CO.
WAUKESHA, WISCONSIN

To study in detail the reasons why Butler Weigh Batchers offer more in instant control, faster production, split-hair accuracy and years of dependability,—write for Bulletin 150E.

HOW NAYLOR PIPE OFFERS YOU
The Means to Any End



Although Naylor pipe is light-weight pipe, Naylor's wide variety of standard-weight ends enables you to use Naylor pipe with fittings and equipment common to industry. It is possible to change connections quickly from one type to any other as required. By careful selection of the Naylor coupling best-suited to your job, you can save time, work and money.

A section of the Naylor Catalog provides helpful information on the subject of pipe connections. If you have not already received a registered copy of Naylor Catalog No. 44, it will pay you to write for it today.

Naylor

NAYLOR PIPE COMPANY
1248 East 92nd Street • Chicago 19, Illinois
New York Office: 350 Madison Avenue • New York 17, N. Y.

Manufacturers' Activities

Ideal Development Co., Buffalo, N. Y. has bought 18 slate quarries in Pawlet, Poultney and Wells, Vt., and will manufacture a new line of slate brick and tile developed experimentally in Buffalo. Bricks will be sawed from solid slate for building fronts and other decorative purposes. The tile will be made from quarry refuse. Roofing slate and mill stock will also be produced.

Ford Motor Co. will discontinue manufacture of tractors for Harry Ferguson, Inc., on or about June 30, 1947, Henry Ford II, president of the Ford Motor Company, has announced. It will continue the manufacture of the Ford tractor after that date. Tractors and implements will be distributed through independent distributors and dealers, and not through the Ford branches.

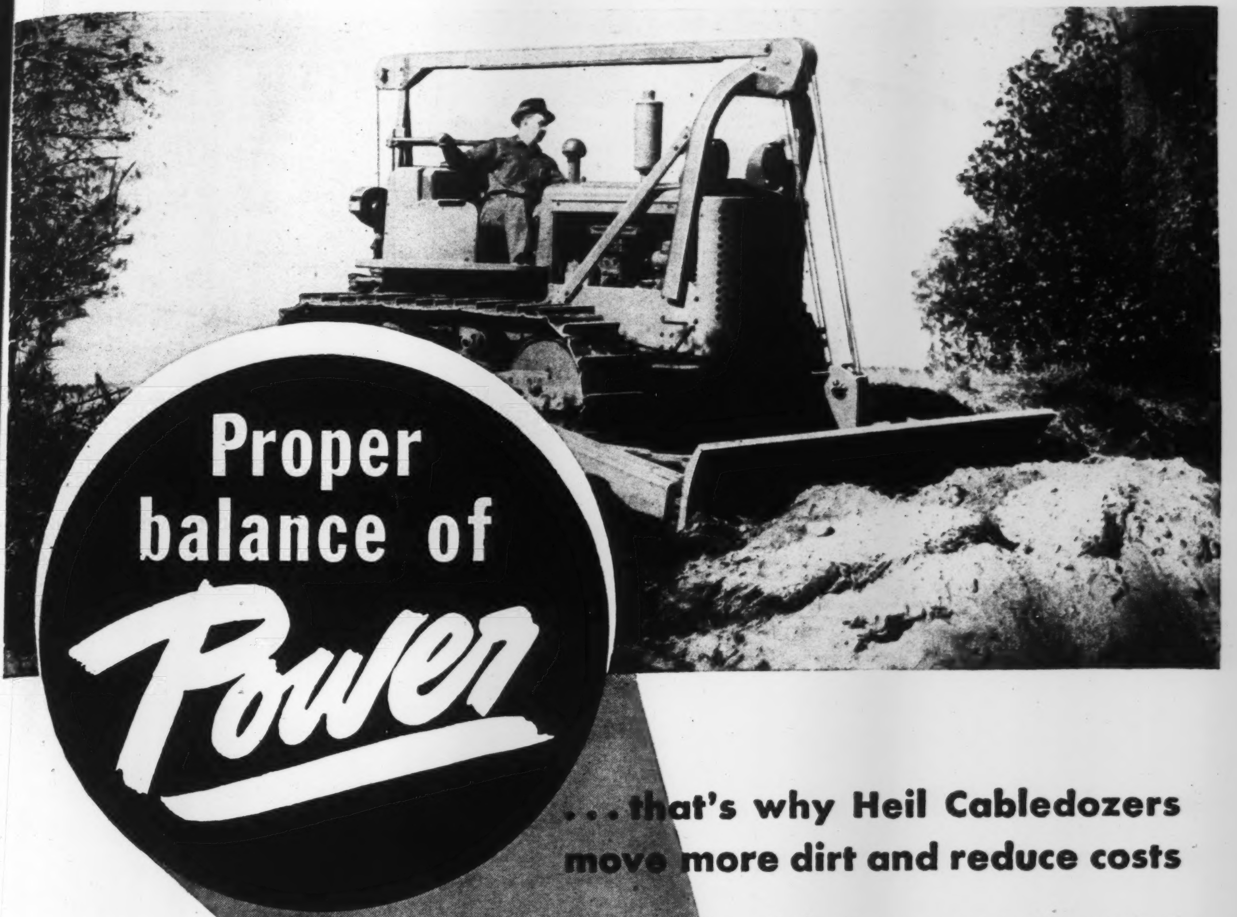
Frank R. Pierce, a former vice-president of General Motors, has become president of the Dearborn Motors Corp., the newly formed company which will distribute Ford tractors and farm implements. Headquarters for the new corporation will be in Dearborn, Mich.

Reflecting its confidence in the continued importance of Pittsburgh as a manufacturing center, H. K. Porter Co., Inc. announced that it was moving its two Quimby Pump manufacturing operations in New Jersey to be centralized in the company's plant at 49th & Harrison Sts. in Lawrenceville.

A. C. Roeth, Jr., has been appointed St. Louis district sales manager of the Inland Steel Co. He will succeed P. M. Lorenz. Mr. Roeth has been with the company since 1933.

Clinton T. Hallsted has been appointed manager of the American Lumber and Treating Co.'s San Francisco sales office, located at 604 Mission St., succeeding Marx Hyatt who headed the San Francisco office for seven years and will enter business for himself. Mr. Hallsted will be responsible for sales of the various treating services available at the American Lumber and Treating Co.'s Wauna, Ore., and Weed, Calif. plants.

James H. Markley is general manager of the newly equipped plant and



. . . that's why Heil Cabledozers move more dirt and reduce costs

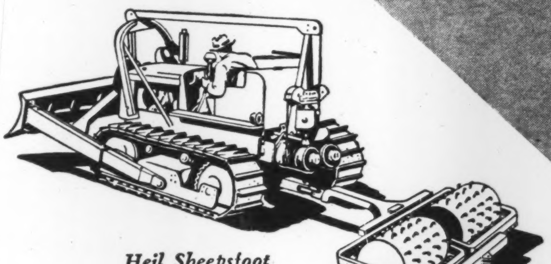
Get in and dig — that's what your tractors have to do if you are going to move dirt economically. They must make full use of their tractive power.

Taking this into account, Heil designed its Cabledozers for International Crawler Tractors so that tractor balance is not disturbed in any way. There is no nosing down or rearing up. Instead, you get full driving and penetrating power at the blade.

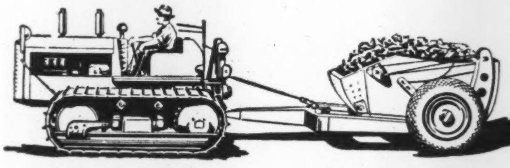
That is what Heil calls proper balance of power and — that is why famous Heil Cabledozers cut cleanly, and smoothly, and move more dirt.

Literature describing many other Cabledozer advantages is available. Write for it or see your International Industrial Power distributor.

R-87



Heil Sheepsfoot Tamping Roller.



Heil 3½ yard, 2-wheel rear-dumping Cable Scraper.

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

KEEP THOSE CONCRETE EXPANSION JOINTS SEALED ALL YEAR 'ROUND!

SPECIFY

THE ORIGINAL
Para-Plastic
REG. U. S. PAT. OFF.
HOT-POURED RUBBER SEAL

TOP SEAL BONDS FIRMLY WITH CONCRETE SLABS DURING Sub-Zero TEMPERATURES

PARA-PLASTIC is the ORIGINAL hot-poured rubber seal for concrete expansion joints.

PARA-PLASTIC remains flexible all year 'round. Its elasticity is permanent in any temperature without breaking its bond with concrete.

PARA-PLASTIC is the positive and permanent top seal for concrete expansion joints all year 'round against the infiltration of water.

Write for further technical information

"STICK" WITH THE ORIGINAL ALL YEAR 'ROUND

SERVICISED PRODUCTS CORP.
6051 West 65th Street Chicago 38, Ill

warehouse of the New York Steel & Rock Bit Corp., 1211 Wyatt St., New York 60, N. Y. The shop handles new and reconditioned hollow drill steel, moil points, rethreading, reshanking, etc. Pyrometer controlled furnaces and expert workmanship are available.

The LaPlant-Choate Manufacturing Co., Cedar Rapids, one of the world's largest manufacturers of bulldozers for tractors, is going into the rubber-tire tractor unit field. Last March the firm announced the setup of its distribution system, and within four months the firm had distributors in both North and South America. LaPlant-Choate soon expects to sell complete packages. E. R. Galvin, executive vice president and general sales manager, says that rubber-tire tractors present a new field, and adds that the new units will transport dirt faster and cheaper. Tractor-drawn units carry 70 yards of dirt an hour, while the new units will transport 150 yards an hour.

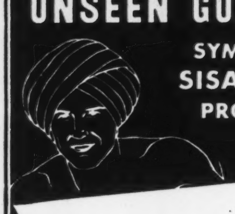
Known throughout the automotive industry as one of the largest manufacturers of special truck equipment, the Thornton Tandem Co., Detroit, Mich., has discontinued that name and now is operating as Detroit Automotive Products Corp., F. D. Knoblock, president, announced. He explained that the former name was appropriate when the Thornton tandem drive was the only product manufactured by the company, but the addition of new products called for a name more accurately describing the business. He added there has been no change in management, personnel or corporate structure. Other officers and executives are A. F. Knoblock, chairman of the board; S. E. Baker, vice president; R. F. Barnum, secretary-treasurer and Ivan Graham, sales manager.

The Chicago offices of Hewitt-Robins Incorporated have been combined with the moving of the Robins Conveyor division office from 37 West Van Buren St., to that of the Hewitt Rubber division at 7 South Dearborn St., Chicago 3, Ill. Enlarged quarters are adequate to house the offices of both divisions.

G. S. Parsons recently opened for business in San Diego, Calif., as a dealer in equipment manufactured by The Lincoln Electric Company, Cleveland, Ohio.

Emmett W. Hines has been appointed manager of the New York zone of the Otis Elevator Co. The zone includes metropolitan New York and nearby counties in New York and New Jersey. Mr. Hines replaces George A.

..Meet the
UNSEEN GUARDIAN
SYMBOL OF SISALKRAFT PRODUCTS



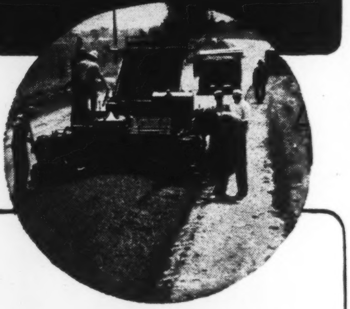
✓ SISALKRAFT
... waterproof reenforced building paper

✓ SISALATION
... reflective insulation and moisture-vapor barrier

✓ COPPER ARMORED SISALKRAFT
... Sisalkraft plus pure electro deposit copper

THE SISALKRAFT CO.
CHICAGO, ILLINOIS

Over 60 years of Service to
CONTRACTORS



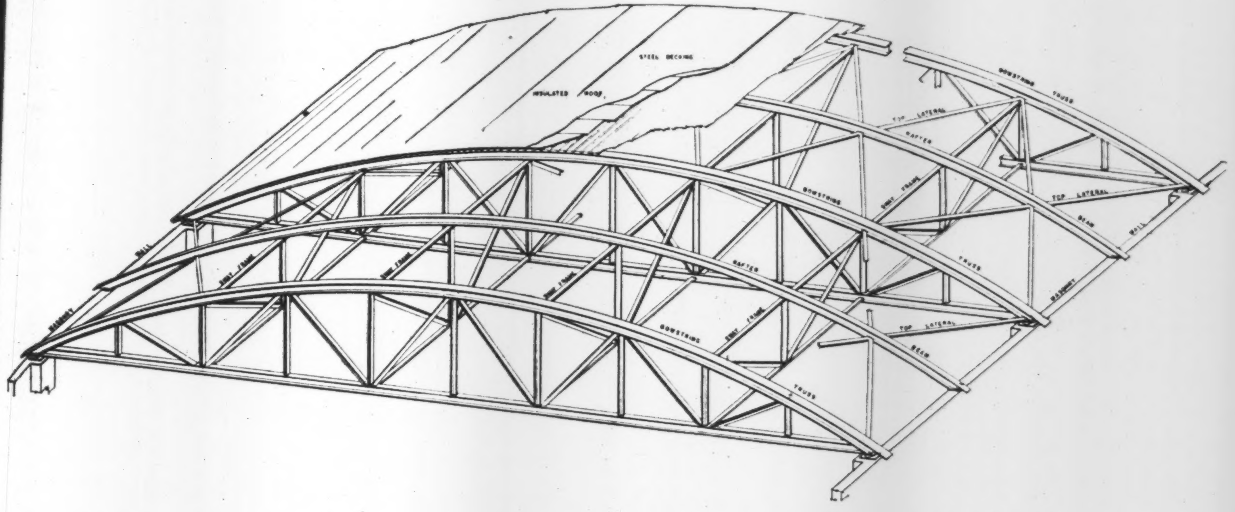
- Bid and Performance Bonds
  Construction Contracts
- Public Liability
- Automobile
- Workmen's Compensation
- Equipment Floaters

AMERICAN SURETY COMPANY
NEW YORK CASUALTY COMPANY
SURETY FIRE INSURANCE COMPANY
100 BROADWAY, NEW YORK 5, N. Y.
Agents and Brokers Everywhere

Welded Bow String Roof Truss is Economical and Efficient

By Ned L. Ashton

Consulting Engineer, Iowa City, Iowa



THE arc welded bow string roof truss shown above is intended for a 72-foot clear span roof supported on masonry walls, used in combination with an insulated steel deck. This type roof is ideal for large store buildings, hangars, garages, small factories, display rooms, etc.

The bow string truss is economical—uses only 4.4 lbs. of steel per square foot of area for the truss shown—and provides wide entrance-exit openings at ends of the building.

The truss consists of curved 6"-wide flanged top chord sections, 6" light beam section bottom chords and 3" x 4" T section web members joined by electric arc welding. Trusses are spaced at 18'-0" centers and span 72'-0". Curvature radius of the top chord is 72', same as span length. Trusses are 9'-7¾" deep, center to center of chords, at the middle.

MINIMIZES STRESSES

Truss weight is estimated at 3200 lbs. per truss or 45 lbs. per foot of one truss. The dead load from roofing materials is slightly less than 12 lbs. per square foot. An analysis of the dead load web stresses reveals that they are very small. In fact, the truss is designed so that, under the dead load or a uniform snow load covering the whole span, there is no beam action of the top chord, the stress in every diagonal is zero and the stress is constant throughout the bottom chord. Under half live load conditions, the stresses in the web members alternate between tension and compression going from one member to the next along the truss. Both the chord and web stresses are reversible under varying wind conditions—the same member acting either in tension or compression depending on which way the wind is blowing.

RAFTERS AUGMENT TRUSSES

In addition to the bow string trusses, the roof decking gets support from light intermediate-curved 6" joist section rafter beams. These make the truss spacing independent of the purlin span. In longer spans, 2, 3 or more of these intermediate rafters should be used between trusses for economy.

Rafters are 5-span continuous beams supported at intervals of 14'-4¾" by the longitudinal sway frame trusses, and supported transversely by the top lateral bracing. In turn, the rafters cut down the unsupported length of the laterals.

REQUIRES LITTLE FIELD WELDING

Both the 72-foot trusses and the sway frames are designed to be completely fabricated in the shop. Field erection welding is confined to joining the sway frames, rafter beams, top laterals and roof decking.

A detailed study of this roof and the bow string type truss is made in a new series of Plates of "Studies in Structural Arc Welding," published by Lincoln Electric. To be placed on the mailing list for these and future Studies, write THE LINCOLN ELECTRIC COMPANY, Dept. 254, Cleveland 1, Ohio.

(Advertisement)

RESERVED

for YOU... if you need *accurate* *answers* to your increasing Figure Work problems. FRIDEN Fully Automatic Calculators are accepted as a necessity by businesses... both large and small. To learn about this *easy to operate* calculator... simply call your local Friden Representative and arrange for a convenient demonstration on your own work, and you too will join the ranks of the thousands of Friden Users.

Friden Mechanical and Instructional Service is available in approximately 250 Company Controlled Sales Agencies throughout the United States and Canada.

FRIDEN

FRIDEN CALCULATING MACHINE CO., INC.
HOME OFFICE AND PLANT • SAN LEANDRO, CALIF., U. S. A. • SALES AND SERVICE THROUGHOUT THE WORLD

Mount, who is retiring after 34 years with the Otis organization.

Announcement of the appointment of T. C. Mallon as assistant manager, commercial and truck department, Chevrolet Motor Division, General Motors Corp., is made by J. W. Burke, manager of the department. Mr. Mallon is experienced in all phases of the truck and special equipment field and was formerly Chevrolet zone truck manager at Omaha, Neb.

Modern office and manufacturing buildings of the Drott Manufacturing Corp. at 4344 North Green Bay Ave., Milwaukee 12, Wis., have been completed. Expansion from midwest to national distribution in recent years and addition of new products to its line created a need for greater production facilities for this long-time manufacturer of tractor-mounted equipment and other industrial machines.

George Malvese & Co., Jericho Turnpike, New Hyde Park, L. I., N. Y., has been appointed by LeRoi Co., Milwaukee, Wis., as their exclusive distributor for the New York counties of Kings, Nassau, Queens, and Suffolk. This company has been in business in this area since 1921, and will represent LeRoi for their portable Airmaster compressors and Tractair. They handle a complete line of road machinery.

R. G. LeTourneau, Inc., Peoria, Ill., announces the appointment of Robert C. Judd as market research manager, to study applications of present equipment to present markets; analyze applications of present equipment to new markets; and study new markets for potential development of new products.

Appointment of W. R. Persons as sales manager of the Lincoln Electric Co., Cleveland, Ohio, has been announced. Mr. Persons has had a broad variety of sales experience with the company.

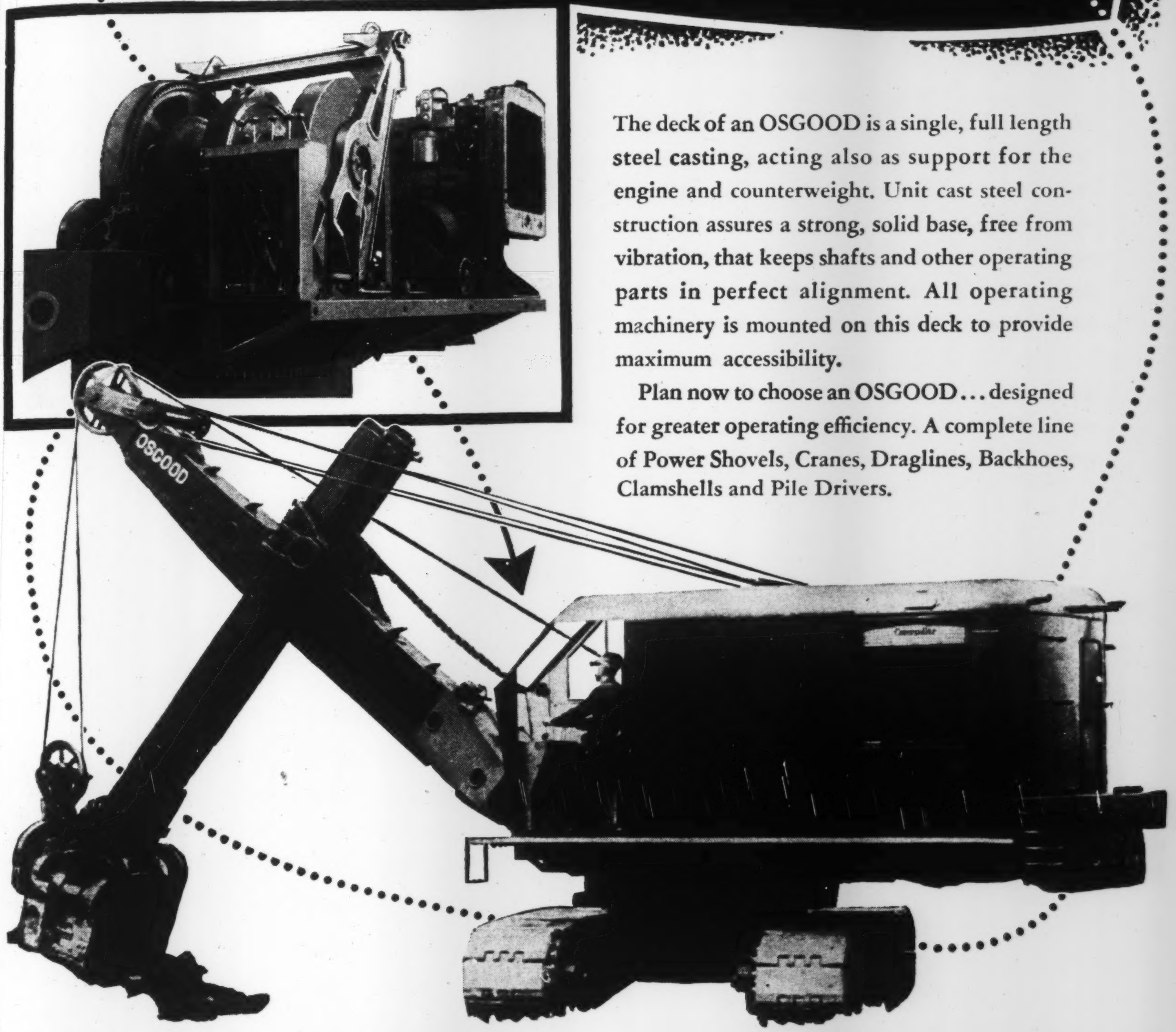
Joseph C. Costello, manager of the San Francisco district, explosives sales department, Atlas Powder Co., Wilmington, Del., retired Jan. 1 after having completed twenty-five years' service with the company.

Formation in Seattle of a Western division to supervise continually expanding operations on the Pacific Coast has been announced by Monsanto Chemical Co., St. Louis, Mo. The new operating division consists of four plants which were the principal units of I. F. Laucks, Inc., for the manufacture of plywood glues, paint and wood preservatives. One plant is situated at Los

UNIT Cast Steel CONSTRUCTION

FOR MAXIMUM STRENGTH • PERMANENT SHAFT ALIGNMENT • MORE EFFICIENT ARRANGEMENT OF MACHINERY

ON AN OSGOOD



The deck of an OSGOOD is a single, full length steel casting, acting also as support for the engine and counterweight. Unit cast steel construction assures a strong, solid base, free from vibration, that keeps shafts and other operating parts in perfect alignment. All operating machinery is mounted on this deck to provide maximum accessibility.

Plan now to choose an OSGOOD... designed for greater operating efficiency. A complete line of Power Shovels, Cranes, Draglines, Backhoes, Clamshells and Pile Drivers.

POWER SHOVELS • CRANES • DRAGLINES • CLAMSHELLS • BACKHOES • PILE DRIVERS

THE OSGOOD CO. O-G **THE GENERAL CO.** EXCAVATOR

MARION OHIO

DIESEL, GASOLINE OR ELECTRIC POWERED • ⅜ TO 2½ CU. YD. • CRAWLERS & MOBILCRANES

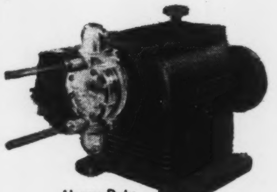
Contaminated Water Supplies?

GET

% PROPORTIONEERS %

CHEM-O-FEEDER

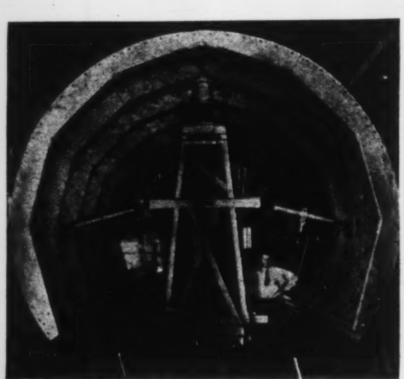
The discovery of harmful organisms and disease germs in your water supply is something to get excited about . . . destroy them by hypochlorination with %Proportioneers% Heavy Duty Chem-O-Feeder — the modern way to protect the health of your community. There's no risk of dangerous undertreatment or the disagreeable taste resulting from wasteful overtreatment. By simply turning a knob, the chemical feeding rate may be instantly adjusted while the pump is operating . . . up to 7 g.p.h. can be fed with extreme precision.
In addition to handling hypochlorite solution, the Heavy Duty Chem-O-Feeder successfully feeds all other water treating chemicals — soda ash, lime slurry, aqua ammonia, activated carbon, sulfates, ferric chloride, polyphosphates, etc.
For help with your chemical feeding problems write %Proportioneers, Inc.%. Ask for Bulletin SAN-2.



Heavy Duty Chem-O-Feeder

% PROPORTIONEERS, INC. %
92 CODDING STREET • PROVIDENCE 1, RHODE ISLAND

STEEL FORMS
for Tunnels
Sewers
Conduits
Walls



TUNNEL SHIELDS
Complete with Hydraulic Equipment

AIR LOCKS
of All Types

Write for Bulletin #12

ROBERT S. MAYO
Construction Engineer
LANCASTER, PENNSYLVANIA

Angeles, Calif., and major plant sit are situated at Seattle, where a $2,00 000 three-year construction program scheduled to start next spring. Include in the division are plants at Lockpor N. Y., and Portsmouth, Va.

Recent appointments to positions i the wood preserving division of Ko PERS Co., Inc., Pittsburgh, Pa., includ E. R. Snodgrass, chief engineer an D. A. Mitchell, general superintenden of plants and operations.

The shovel and crane division LIMA LOCOMOTIVE WORKS, INC., Lim Ohio, has named J. W. Artz director parts sales and service. Mr. Artz ha been associated with the Lima compan since 1928. Howard W. Read has bee appointed parts sales manager, wit William D. Lutes assistant parts sale manager. T. A. Griffin has been ap pointed service manager of the shove and crane division.

The seventh in a chain of plywoo distributing warehouses will be opene shortly at 3201 Oak Lane, Dallas, Texas by U. S.-MENGEL PLYWOODS, INC., company jointly owned by The Menge Company and United States Plywoo Corporation.

JOSEPH S. YOUNG, president of th Lehigh-Portland Cement Co., Allen town, Pa., has been elected a boar member of the National Industrial Con ference Board.

NORDBERG MFG. CO., Milwaukee, Wis has purchased the Busch-Sulzer Bros Diesel Engine Co., St. Louis, Mo., and will continue operations there.

J. E. OBERNESSER, former general su perintendent of the International Har vester Milwaukee works, has been ap pointed works manager at Milwauke to succeed Menno Felber, who become works manager of the firm's Maywood Ill., plant. William C. Brice has been made general superintendent of the Milwaukee works and L. E. Emley wil be his assistant.

In a move intended to better reflec the expanded scope of the company's activities, Ladish Drop Forge Co., Cudahy, Wis. (for over 40 years one o the largest producers of steel and alloy forgings for industry), has announced that the corporate name has been changed to Ladish Co.

KENNETH T. FAWCETT has been appointed vice-president of Dominion Brake Shoe Co. Ltd., a Canadian subsidiary of American Brake Shoe Co., with whom he has been associated since 1934.

GUARANTEED

... to outdig any dragline bucket at any depth!

When properly used Page AUTOMATIC Buckets will outdig ordinary buckets of comparable size.

That's a guarantee you can easily prove for yourself by a competitive test. Compare the production of your present bucket with that of an AUTOMATIC. Hundreds of dragline operators in all kinds of digging have found that their AUTOMATIC buckets dig more yards at a lower cost per yard than any other dragline bucket they have ever used.

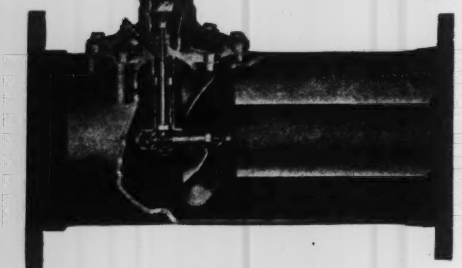
Here's why: Page AUTOMATICS dig right in at the first pull on the load line and get a full pay load within one to three bucket lengths regardless of the depth — 20 ft., 100 ft. or more. This means that most of your operations are under or near the end of the boom point where the minimum amount of power is required for hoisting the load. Perfect balance of the AUTOMATIC assures perfect control whether loading or dumping. Quick loading features of AUTOMATIC buckets mean less wear and maintenance on the bucket, cables and the dragline as well as minimum operator fatigue. For more complete details, see your own construction equipment distributor or write for new booklet "How to Get the Most Out of Your Page Automatic Dragline Bucket."

PAGE ENGINEERING COMPANY
Clearing Post Office • Chicago 38, Illinois

PAGE *Automatic*

DRAGLINE BUCKETS and WALKING DRAGLINES

SPARLING MAIN-LINE METERS



Cutaway View to
Show Direct Action
of Sparling Meters

Can You Account for 90% of Your Output?

Hundred per cent metering on services is excellent. But unless your mains are metered, too, you might be wasting more water than that previously wasted by all your customers put together!

Sparling Main-Line Meters have been giving Service and Satisfaction for over 27 years. They will serve you on pump, reservoir, treatment and distribution lines.

•

For prices and flow ranges, see Bulletin 309, free upon request.

•

R. W. SPARLING
Manufacturer of WATER MEASURING EQUIPMENT

LOS ANGELES 54...Box 3277 Terminal Annex
CHICAGO 16........3104 South Michigan Ave.
622 Broadway...............CINCINNATI 2
101 Park Avenue............NEW YORK 17
BOSTON 8...................6 Beacon Street

GUNITE
PNEUMATICALLY PLACED CONCRETE
DENSE • DURABLE • HIGH STRENGTH
for
Restoring Disintegrated Concrete
Dam, Dock and Bridge Repairs
Steel Encasement and Fireproofing
Sewer, Water Pipe and Penstock Linings
Stack and Bunker Linings
Wood Pile Casings—Pressure Grouting
Prestressed Tanks and Silos
Get in touch with us for engineering data and estimates
GUNITE CONSTRUCTION CORPORATION
420 LEXINGTON AVE., NEW YORK 17, N.Y.
MURRAY HILL 3-7699

OHIO
LOCOMOTIVE CRANES

20 to 50 TON CAPACITY
DIESEL • ELECTRIC • GASOLINE • STEAM
The OHIO LOCOMOTIVE CRANE CO.
BUCYRUS . . . OHIO

Manufacturers' Publications

Building Maintenance and Estimat—Two catalogs, "Building Savers." On is a condensed, 12-p. catalog of information on floor treatment and waxes; concrete admixtures (waterproofing an dampproofiing); paints and protectiv coatings; roof coatings and caulkin compounds. The second pamphlet is 4-p. estimating guide for use of th company's products.—*L. Sonneborn Sons, Inc.,* 88 *Lexington Ave., Ne York* 16, *N. Y.*

Airplane-Tired Road Roller—Four page folder describing and illustratin "Cemco" Flat-Iron pneumatic tired roa roller.—*Construction Equipment & Manufacturing Co.,* 2434 *Universit Ave., St. Paul* 4, *Minn.*

Fabricating and Processing Aluminum—"Technical Advisor" is new monthly technical paper devoted to publicizing latest recommendations on how to use aluminum mill products most effectively. Question-and-answer section is dedicated to making availabl to wider audience answers to many questions sent in to Reynolds technical men. Another feature is technical process studies included serially. Current series is devoted to welding of aluminum, with first issue covering general factors involved, weldability of various aluminum alloys, application of gas welding, and edge preparation for gas welding.—*Reynolds Metals Co.,* 2500 *S. Third St., Louisville* 1, *Ky.*

Soil-Cement—(12-p. bulletin) Is designed to give public officials essential facts about use of soil-cement for light traffic roads and streets. Projects in 26 states are illustrated and described. —*Portland Cement Assn.,* 33 *W. Grand Ave., Chicago* 10, *Ill.*

Loader—(8-p. folder) Features improved model for high-speed, low-cost loading of large hauling equipment. Profusely illustrated, it contains much technical information and specifications for Model BV loader.—*Euclid Road Machinery Co., Cleveland* 17, *Ohio.*

Crushing Equipment—(16-p. bulletin) Covers entire line of crushing, pulverizing, conveyor, screening and washing equipment, including portable plants and basic units, and pictures typical installations, together with flow of material diagrams.—*Universal*

After making new world's speed record for hard-rock tunnel-driving, crew members of two shifts pose for photo in front of east portal of Rams Horn Tunnel.

WORLD'S SPEED RECORD SET

by Tunnel Drivers Using "GELEX"

A NEW world's record for high-speed, hard-rock tunnel driving was recently set by Lowdermilk Bros., Denver, contractors on the 6880-foot Rams Horn Tunnel of the Big Thompson River project in northern Colorado.

In only 24 hours, crew members working in three shifts drove the 12-foot-diameter water tunnel a record-breaking distance of 80 feet through tough, massive biotite granite . . . 6275 feet in from the east portal!

To do the job, the hard-driving tunnel men used 1925 pounds of Du Pont "Gelex" No. 2, breaking a total of 328 cu. yds. of rock at a ratio of 5.8 pounds per cu. yd.

Lowdermilk Bros. found that "Gelex" gave superlative results in the tough, hard rock encountered on this job. Excellent fragmentation speeded mucking operations. Minimum fumes permitted early return to the face. Perforated cartridges eliminated need for slitting, thus reducing loading time. And high stick count gave additional economy.

Talk to a Du Pont Explosives Representative about using "Gelex" on your job. It may mean real savings in time and money.

E. I. DU PONT DE NEMOURS & CO. (INC.)
EXPLOSIVES DEPARTMENT • WILMINGTON 98, DELAWARE

PROPERTIES OF "GELEX" COMPARED WITH SPECIAL GELATIN

	Bulk Strength	Stick Count*	Water-Resistance	Fumes
"GELEX" No. 1	60%	136	Good	Excellent
Special Gelatin	60%	123	Excellent	Excellent
"GELEX" No. 2	45%	150	Good	Excellent
Special Gelatin	40%	114	Excellent	Excellent

*Stick count based on 1 1-8 x 8 inch cartridges varies within limits of 3 per cent.

DU PONT "GELEX"

A Product of Du Pont Explosives Research

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

Whether you're in a hurry or have lots of time —call us for Steel

Symbol of Service

FOR STEEL USERS

We hope you aren't always in a "jam" when you call us for steel. But when you are, we will give you the fastest possible service. And for anticipated needs, you can depend upon us to give your orders exacting attention.

Whether you need a pound or a ton of steel—whether you require Stainless, High Strength or Alloy Steels . . . Hot Rolled or Cold Finished Bars, Structural Shapes, Plates, Sheets, Machinery, etc. — call, wire or write our warehouse nearest you for prompt, dependable service.

United States Steel Supply Company

CHICAGO (90)	1319 Wabansia Ave., P. O. Box MM	BRUnswick 2000
BALTIMORE (3)	Bush & Wicomico Sts., P. O. Box 2036	GIlmor 3100
BOSTON	176 Lincoln St., (Allston 34), P. O. Box 42	STAdium 9400
CLEVELAND (14)	1394 East 39th St.	HEnderson 5750
MILWAUKEE (1)	4027 West Scott St., P. O. Box 2045	MItchell 7500
NEWARK (1), N. J.	Foot of Bessemer St., P. O. Box 479	BIgelow 3-5920 REctor 2-6560 BErgen 3-1614
PITTSBURGH (12)	1281 Reedsdale St., N. S.	CEdar 7780
ST. LOUIS (3)	21st & Gratiot Sts., P. O. Box 27	MAin 5235
TWIN CITY	2545 University Ave., St. Paul (4), Minn.	NEstor 7311

UNITED STATES STEEL

Engineering Corp., 625 C Ave., N. W., Cedar Rapids, Iowa.

Tool Catalog—(96-p. book) Covers laboratory instruments, machine tools, machinists' tools, measuring instruments, optical equipment, and toolroom specialties.—*George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y.*

Vapor Saving Roofs—(8-p. bulletin) Describes expansion roof and improved floating roof of double-deck construction, with information on conservation of petroleum products in storage.—*Graver Tank & Mfg. Co., Inc., 4809 Todd Ave., East Chicago, Ind.*

Pipe in American Life—(48-p. illustrated booklet) Presents historical background and modern uses of metal pipe, with emphasis on use of steel pipe. Chapters are devoted to uses of steel pipe in homes, large buildings, process industries, railroads, shipping, mining, water supply systems, oil industry, gas industry, refrigeration, irrigation and on farms.—*American Iron and Steel Institute, 350 Fifth Ave., New York 1, N. Y.*

Aluminum Alloys—(248-p. book) Features 106 tables of technical data, describes briefly history of aluminum, discusses alloy tempers and physical properties, and presents detailed data on chemical, physical and mechanical properties of high purity aluminum. Subsequent chapters take up various mill products, including sheet and plate, extruded shapes; roll formed shapes; tubing and pipe; wire, rod and bar; forging stock; ingot metal; press forgings.—*Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky.*

Screening and Crushing Plants—(4-p. bulletin) Describes new Hammerhil units, with pictures and specifications. Two looseleaf sheets give data on Cedarapids portable power units and bin unit.—*Iowa Mfg. Co., Cedar Rapids, Iowa.*

Modern Structures — "Airports," "Field Houses," "Utility Hangars," "Standard Building A-40." Pamphlets and sheets describing and illustrating firm's latest structural designs and specifications.—*Luria Engineering Corp., New York and Chicago.*

Weekly Wall Calendar — (12x20-in. calendar-catalog) Fifty-two weekly pages feature standard items like tracing paper, ruling pens, drafting machines and furniture, as well as new drafting room furniture ready for 1947. Engineering data are given in back.—*Frederick Post Co., P. O. Box 803, Chicago, Ill.*

NG

E

N

A M